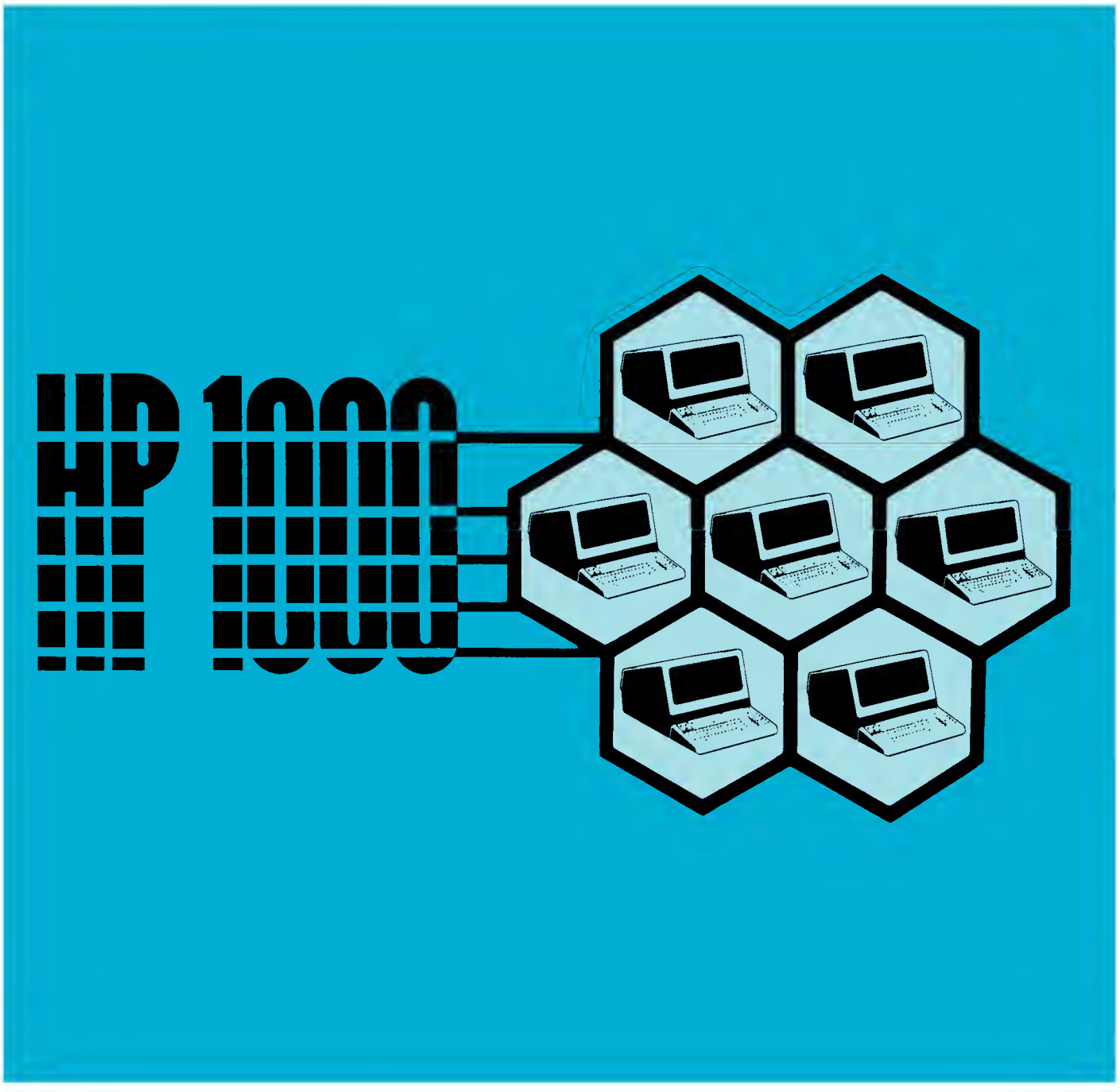
HEWLETT PACKARD

HP 92068A
RTE-IVB Batch and Spooling

Reference Manual



RTE-IVB Batch and Spooling

Reference Manual

HEWLETT-PACKARD COMPANY
Data Systems Division
11000 Wolfe Road
Cupertino, California 95014

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Preface

This manual describes the scope, format, and use of the RTE-IVB Batch and Spooling system. It is intended to be the primary reference source for anyone using batch processing or spooling within the RTE-IVB operating environment.

This manual is divided into five Chapters as follows:

Chapter One gives a general description of the features of the Batch and Spooling System.

Chapter Two defines and describes using the Spool System in a session environment, and batch processing.

Chapter Three describes using the Spool System via programmatic calls to the Spool Monitor Program (SMP).

Chapter Four describes use of the GASP program, which provides for operator control of the Batch and Spooling System.

Chapter Five describes how to initialize the Batch and Spooling System. In a session system, only the system manager may do this.

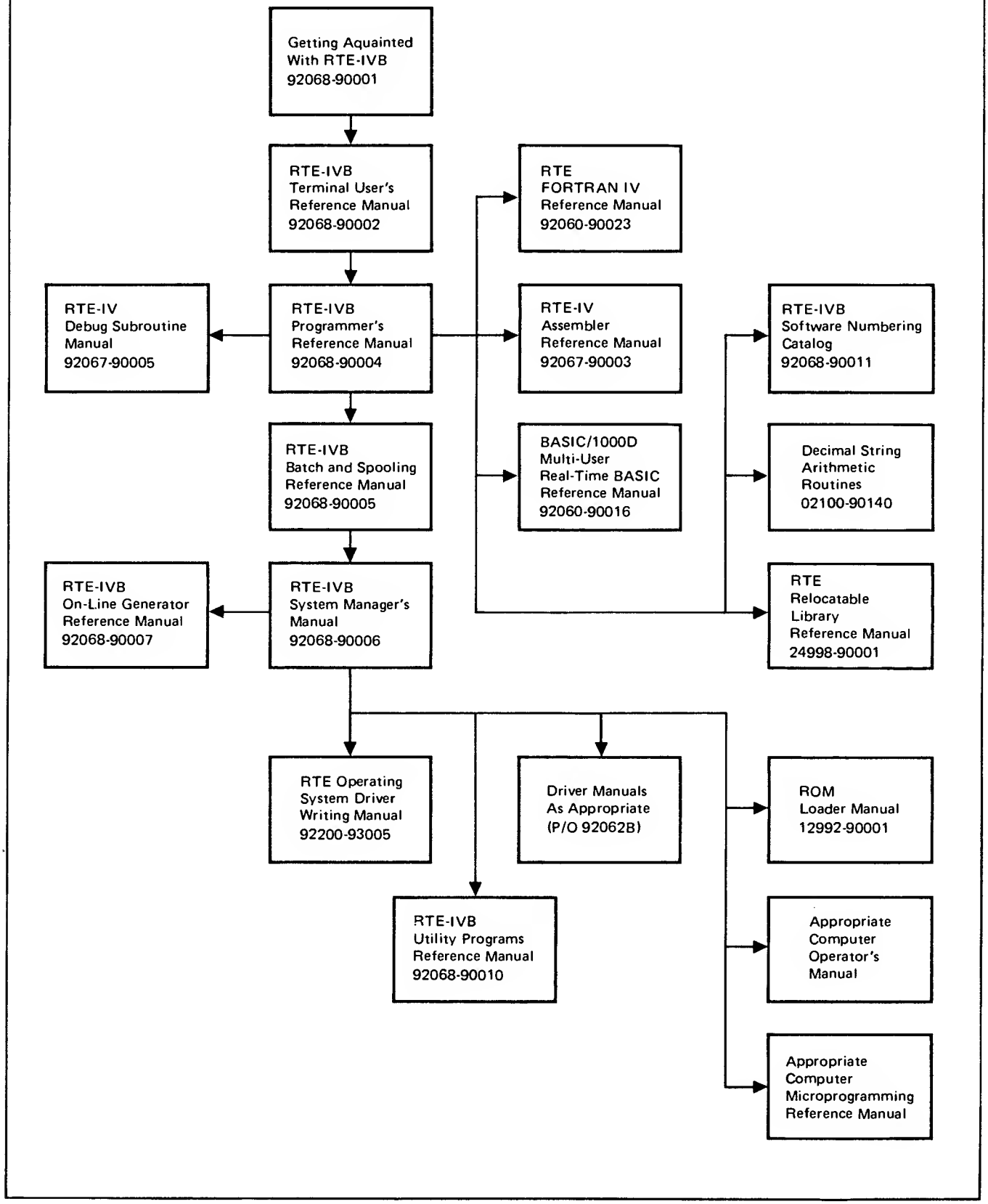
Three additional reference manuals that are directly related to the RTE-IVB Batch and Spooling System are briefly described below:

* RTE-IVB Terminal User's Reference Manual. This manual describes the features of the RTE-IVB operating system that are available to the user in an interactive mode.

* RTE-IVB Programmer's Reference Manual. This manual describes the features of the RTE-IVB operating system available to user-written programs.

* RTE-IVB System Manager's Manual. This manual contains the information necessary to plan, generate, and maintain the RTE-IVB operating system.

RTE-IVB Documentation Map



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Chapter 1
System Overview

Introduction

The Batch and Spooling System operates under control of the RTE-IVB operating system to provide spooling and batch processing capabilities.

Batch jobs are processed by the File Management System's program FMGR. Spooling capabilities are provided by the Spool Monitor Program (SMP).

Features

With the Batch and Spooling System, the RTE-IVB user may perform the following tasks:

* Automatically spool input and output in a system or batch job
* Control spool input and output through operator commands from sessions or program calls
* Prepare and test programs in a batch job system
* Control batch job processing from a terminal or file using an extensive job control language
* Enter jobs in the batch stream by priority and with time limits
* Output data from sessions or jobs by priority

Batch-Spool System Components

The File Management System processes batch jobs by means of operator commands to the program FMGR. The Spool System controls spooled input and output in a session or batch job. Table 1-1 illustrates the components of the Batch and Spooling System.

Table 1-1. Batch-Spool System Programs and Routines

SUBSYSTEM	PROGRAM	FUNCTION
FILE MANAGEMENT SYSTEM	FMGR	is the operator interface for file management and batch processing. The FMGR commands are entered by an operator from a console or from a previously prepared procedure file.
SPOOL SYSTEM	JOB	provides the inspool capability for batch jobs. It reads jobs from an input device and places them on a disc file or reads the jobs directly from disc. JOB places each inspooled job in a queue of jobs to be processed.
	GASP	provides a set of commands to allow operator control of the batch and spooling process.
	SMP	maintains information on all active spools in the system and coordinates job processing with outspooling. Program calls to SMP control spooled input and output either inside or outside of a session or batch job.
	SPOUT	writes the output from completed or active session and jobs to specified output devices. SPOUT is never directly requested by a user.
	DVS43	is the driver routine used to implement disc accesses for spooling. It is independent of user control. Note that DVS43 is not compatible with the floppy disc driver DVR33.
	EXTND	controls the automatic assignment of extents to spool files as needed. It operates without user intervention.

Spooling

The Spool System is used in conjunction with the File Management System to provide spooling capabilities.

When an I/O device is spooled, all references to that device will be automatically translated to refer to a file on disc, the spool file. Since disc I/O is much faster than that of most peripheral devices, spooling makes highly efficient use of a system's I/O devices.

The FMGR commands :SL and :CS can be used to interactively set up and control a spooling environment within a session. This capability provides session users the ability to perform disc I/O via EXEC or FORTRAN formatted I/O calls.

Spooling can be utilized in a session, a batch job, or programmatically via calls to the SMP program.

Batch Processing

Batch processing, the entry of one or more jobs for processing in a job stream, is controlled by FMGR commands. The jobs themselves may be stored on disc or other input device. In either case, batch job operation is controlled through FMGR commands that delimit the job and that may be included with the job.

A batch job usually consists of FMGR commands to control system operation, a source language program to be compiled and executed, and data to be manipulated by the program. With batch processing, more than one such job can be placed in the input device so that the running of each job and the transition from job to job takes place with a minimum of human intervention.

FMGR performs batch processing by means of a set of commands that define the beginning and end of each job and effectively define a separate environment for the job. Any of the other FMGR commands can be included in the job itself in order to perform the full range of FMGR functions. Since the job may include programs and the commands to compile or assemble, load, and execute the programs, program development is possible in batch mode. A programmer can submit a job, return to other work and retrieve the output later.

The Spool System is used in conjunction with the File Management System to provide batch job processing with spooling. Spooling allows jobs to be processed according to assigned priorities rather than in the sequential order necessitated by standard batch processing. (Refer to Figure 1-1 for an example of spooling.).

Spooling also allows batch jobs to be read in and queued on a disc. This allows jobs to be executed from the disc, thus they do not have to wait for slow I/O devices to hinder their execution speed.

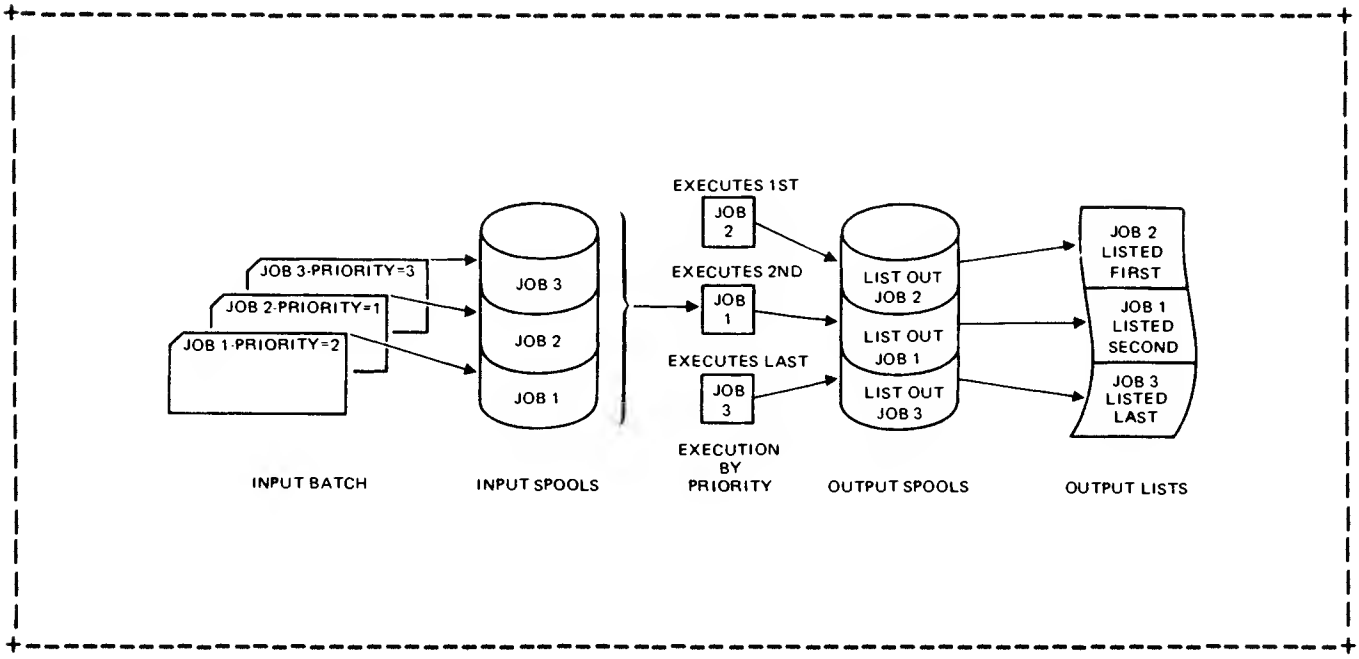

Figure 1-1. Spooled Batch Processing

To illustrate, consider that jobs processed directly from the card reader must be taken in serial order as they are placed in the reader. Also, if the output goes directly to the line printer or other output device, the operating system must wait for the completion of one job before processing the next job. Priority of execution can be managed only by the operator manually inserting one job ahead of others, and lengthy printout from a low-priority job can delay execution of a higher priority job.

When spooling is used, jobs are read from the input device to spool files or from a user file on disc, and a directory of jobs to be executed is created. From disc, the FMGR program selects each job for execution according to its priority. Similarly, the output spool file is selected from the outspool directory and is "outspooled" according to priority independently of input or processing priorities. Transition between jobs is faster as one job does not have to wait for completion of a previous job's output to the print or punch device. Also, since output files are on disc, they may be held until the operator takes action to print or punch them. This is especially convenient if, for example, the output requires a special form on the line printer.

Inspool or outspool files can be allocated automatically by the Spool System or they can be specified by the user. Simplicity of use is achieved if the Spool System allocates and releases all spool files. On the other hand, if a particular file is specified, that file can be retained as a permanent file.

For instance, if you define your own job command file as an inspool file, the job can be kept in that file and, at a later time, it can be re-run by command. In this case, no use is made of system spool files, and "inspooling" consist merely of creating an entry for the file in the job directory. This technique eliminates the necessity of putting a frequently run job on the non-disc input device each time it is executed.

Batch jobs are submitted to the inspool program (JOB). Output spooling to logical unit 6 is performed automatically unless specifically disabled by command in the job stream. Spooling to other devices may be specifically requested.

SMP Program Calls

The program SMP may be scheduled through RTE EXEC calls from a program in order to perform any of several spool control requests. These calls are used to set up and control spooling to and from disc files. The calls provide the capability to equate a logical unit to a disc file and thus allow reading and writing to disc with non-disc I/O calls whether formatted or not. The calls provide spooling capabilities both inside and outside of a session or batch job.

Gasp Operator Commands

A set of operator commands is available through the Spool System program GASP that allow you to interactively control various aspects of the Spool System. These commands perform such functions as:

* Display or change the status of jobs and spool files.
* Hold jobs being inspooled or waiting and subsequently restart them.
* Remove entries from either the output or input directory.
* Place a system-wide hold on the spool system, batch system, or both, or de-activate (kill) both systems entirely.
* Remove spool files from outspool queues.
* Hold and later release outspool files.
* Restart the outspooling of a file.

Chapter 2
Using the Spool Monitor

Introduction

The Spool System operates in conjunction with the File Management System of RTE-IVB to provide spooling capabilities within a session or batch job. Spooling gives the user the capability to automatically send all output to disc files. After this is done, the process known as "outspooling" sends the data output on disc to the specified logical unit destination. Since disc I/O is much faster than that of most peripheral devices, e.g. line printers, spooling can greatly increase the throughput of a program or a job stream. The entire spooling process can proceed automatically, with virtually no user intervention, or it may be directly controlled during its various phases.

When operating within a session or batch environment, the Spool System provides the following capabilities:

* Directs output for non-disc devices to files on disc; when output operation is complete, transfers data from disc to original user-selected non-disc device for output.

* Keeps a record of the current status of all jobs and spool files in the system

* Translates non-disc device references in program I/O calls to references to disc files.

Spooling can be utilized in three distinct ways: interactively within a session, from a batch job, or from a program. Using the Spool System interactively or from a batch job is described in this chapter. Spooling via programmatic calls is described in Chapter 3.

Spooling can be used to increase the throughput of a job stream that is limited by the idle time of slow peripheral devices. It does this by allowing programs to perform I/O to disc files rather than to the slower peripheral devices. The system then manages the I/O between the disc files and the peripheral devices to assure that all I/O ultimately reaches its proper destination.

For example, assume there are 10 compute-bound programs that output one line to the line printer approximately once each second. One way to avoid an interleaved listing would be to have the programs each request an LU lock on the printer during its entire execution. The program that requested the lock first would completely shut out the other programs during its entire computation and output. When the first program finished, the next program to receive the lock would again shut out the other programs. This process would continue until all 10 programs have run to completion. This method wastes system resources since only the line printer or the CPU is operating at any one time.

Under spooling, both the line printer and the CPU are used more efficiently. The programs output their listings to disc files which can be done much faster. Additionally, when one of the programs is suspended for a disc write, another program may use the CPU for its computations and then perform its output to its own disc file. The system handles the task of outputting the disc file to the line-printer. Since the disc files are already built up, they can be output as quickly as the line printer can accept them, thereby eliminating the line printer's idle time.

Interactive Spooling

Within a session environment, the Spool System can be utilized interactively through use of a copy the program FMGR.

The FMGR :SL command establishes an equivalence between a session logical unit and a file on the disc. After this equivalence is made, all I/O requests made to that session logical unit will be translated by the system to reference the associated spool file on disc. When the user wishes to have data in the spool file output to its original non-disc destination, the FMGR :CS command is used. The :CS command can also be used to alter spool options set up by an :SL command.

By using spooling, the session user can have the output of most FMGR commands automatically sent to a file on disc. At a later time, the data on disc can be "outspooled" to the line-printer by the Spool System.

In a multi-user environment, any list devices, such as a line-printer, can be used in a efficient manner if all output sent to them is spooled. Using a device in this manner prevents intermixed listings, and also stops programs from competing for the services of a peripheral device.

Spooling also enables the session user to perform I/O to disc files through ordinary EXEC calls and FORTRAN formatted I/O calls. First an equivalence is made between a session logical unit and a user-defined disc file with the FMGR :SL command. After this is done, any I/O calls which refer to the "spooled" session logical unit will actually reference the user-defined file on disc. After the user enters a :CS,lu command, the equivalence between the session logical unit and spool file is ended.

Spool Files

The disc files used by the Spool System are called spool files. In general, these files are taken from a pool of up to 80 spool files that are created during initialization of the spool system, by GASP. These files are controlled by the Spool System and are given names of the form SPOLnn, where nn is a number between 01 and 80. The files always start with SPOL01 and are numbered consecutively up to the number requested at initialization. They are known as SPOOL POOL FILES.

Besides the spool pool files, any disc file (type 3 or above) can be used as a spool file. To specify an existing file as a spool file you must define it as a spool file with the FMGR :SL command or with the spool setup SPOPN call (Chapter 3). Such files can be saved after use by the Spool System. Spool pool files, on the other hand, are not saved, but are returned to the pool of spool pool files after being closed.

Data in spool files has one of two formats: spool file headers or standard. In either case, a spool file must be a variable-length record file (type 3 or above).

Spool File Format

Spool files used for outspooling can be written by the Spool System with spool file headers. This format has a special two-word header attached to, and preceding, each record in the file. This header preserves the I/O control information specified in the original I/O call. It consists of:

word 1 Control word containing function and subfunction from the original I/O call.

word 2 Length word or extra control word; length word contains the record length in words (positive) or characters (negative) as given in the original I/O call. If the call is a control request, the extra control word is stored here.

The rest of the record contains the data to be written to a device.

Standard Format

Spool Files that are not used for outspooling or that do not require I/O control information need no header. Such files are written exactly as presented. Any I/O requests to the LU associated with a standard spool file are actually attempted to the file itself.

NOTE
Since spooling is an automatic operation, one may make use of the Spool System without a thorough understanding of how it works. You may wish to skip the section on SPOOL SETUP and turn directly to SL - SPOOL SETUP AND OUTSPOOL CONTROL.

Spool Setup

The Spool System is structured so that all programs can run with no change in code when performing I/O to spooled devices. Since spooling is essentially a form of disc buffering, the Spool System must automatically transform nondisc I/O calls to disc I/O calls.

When operating under session control, a user specifies a logical unit to be spooled with the FMGR :SL command (see the following section). When FMGR encounters a :SL command it schedules the Spool Monitor Program (SMP), so that the spooled session logical unit will point to a spool LU. FMGR then finds a free spool pool file (if a user file is not specified) and has SMP make an entry for the entire spool setup in the spool control file, SPLCON. This 16-word SPLCON record will contain information which includes the spool LU, spool file name, and outspool logical unit.

SMP completes a spool setup by setting up the spool Equipment Table (EQT) entry associated with the spool LU. When the spool setup is complete, SMP transfers control back to the user's copy of FMGR. After a spool setup is made, any I/O calls made inside that session which reference a spooled logical unit will be redirected to the spool file. The spool driver, DVS43, will actually write data to the spool file. Figure 2-1 illustrates a call to session LU 6 that references driver DVR12 when it is not spooled, but if spooled, references DVS43 and ultimately the disc driver DVR32.

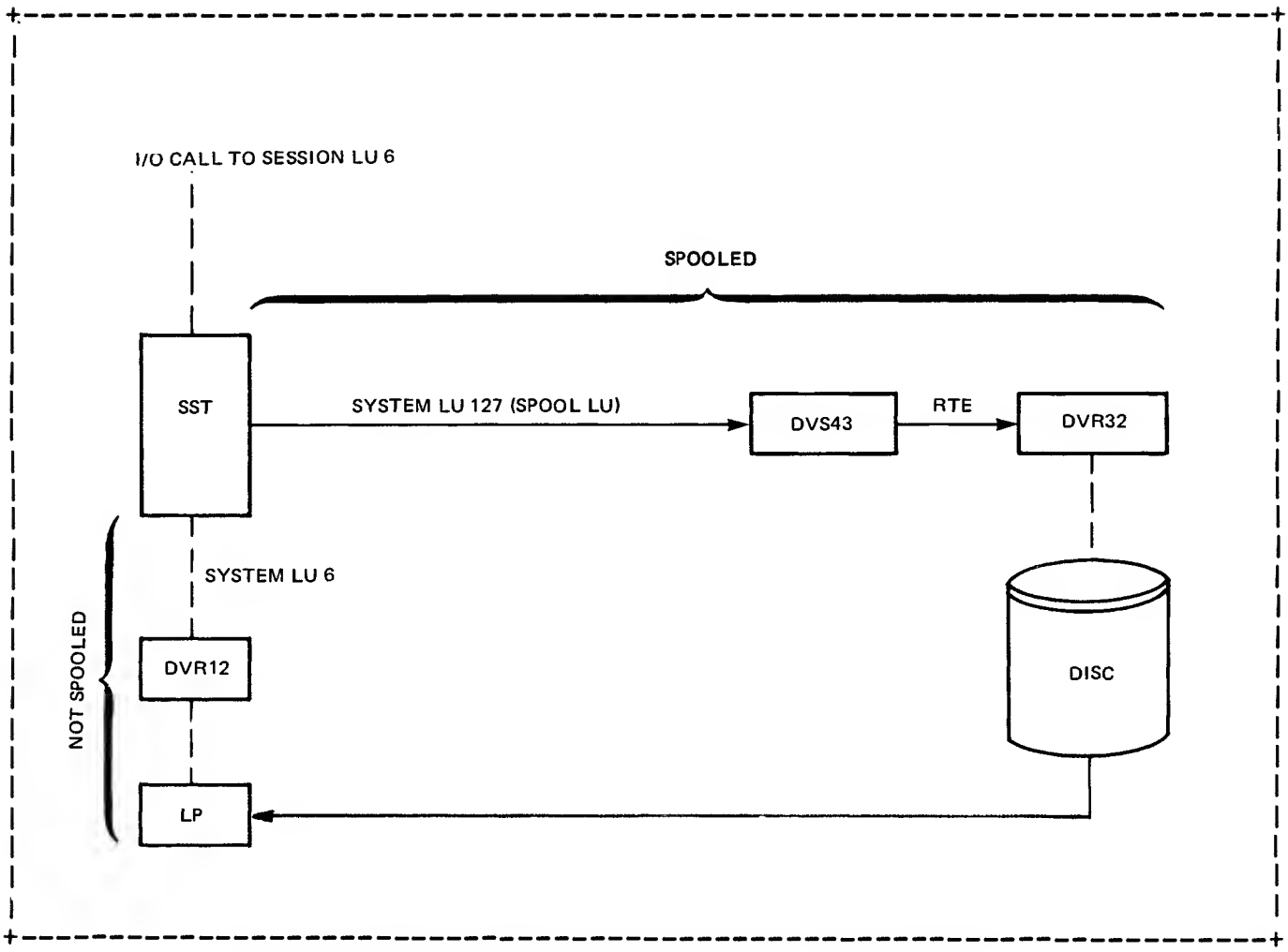

Figure 2-1 Spooled Logical Unit Switching

Notice that the spool setup effectively associates a session logical unit with a disc file. Recall that session logical units are translated to system LU s via the user's Session Switch Table (SST). System logical units are linked to EQT entries through the Device Reference Table (DRT) in RTE (refer to the RTE Programmer's Reference Manual). The EQT entry in turn specifies the I/O select code and I/O driver associated with the device. For a spool LU, its associated EQT entry contains the disc address of a spool file. Figure 2-2 illustrates a session LU - spool file assocation.

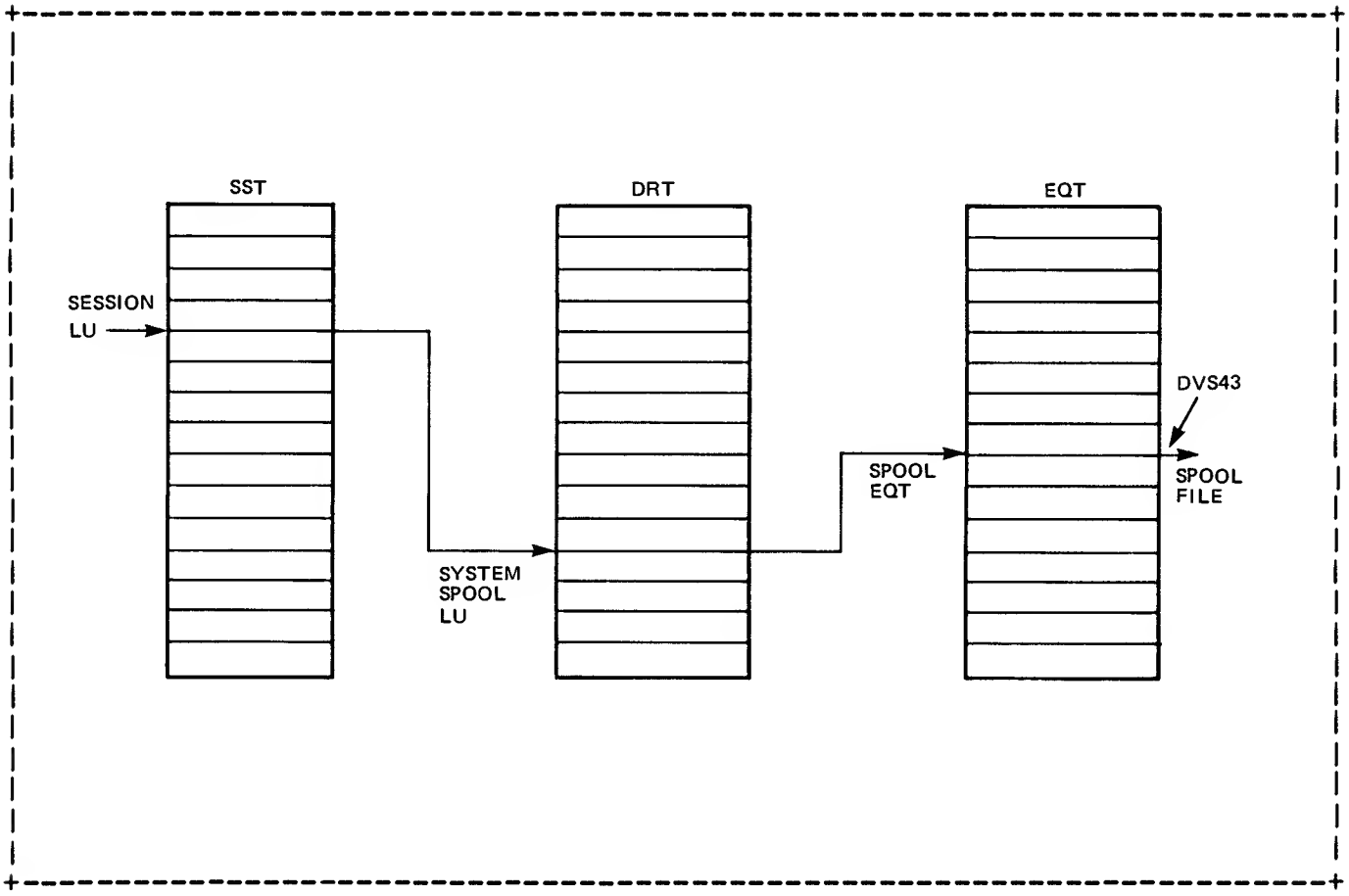

Figure 2-2. Session LU-spool file association

In order to implement a spool setup, an EQT entry must reference the spool driver DVS43 and point to a dummy select code (10B-77B) not used by an actual device. An entry in the DRT must link a system logical unit number, the "spool LU", to a spool EQT entry. These spool entries are all established at system generation time.

EXAMPLE

Assume that a session user wishes to have output spooled to LU 6, the line-printer. In his current SST, session LU 6 points to system LU 6. In order to "spool" session LU 6, the user enters:

```
:SL,6,,,6  (refer to the following section)
```

This command causes FMGR to schedule the SMP program to setup the spool environment. SMP will add an entry to the top part of user's SST so that session LU 6 will point to a spool LU. After FMGR finds a free spool pool file, SMP will write a 16-word spool setup buffer into the file SPLCON. The association between session LU 6, and the spool pool file is shown in Figure 2-3.

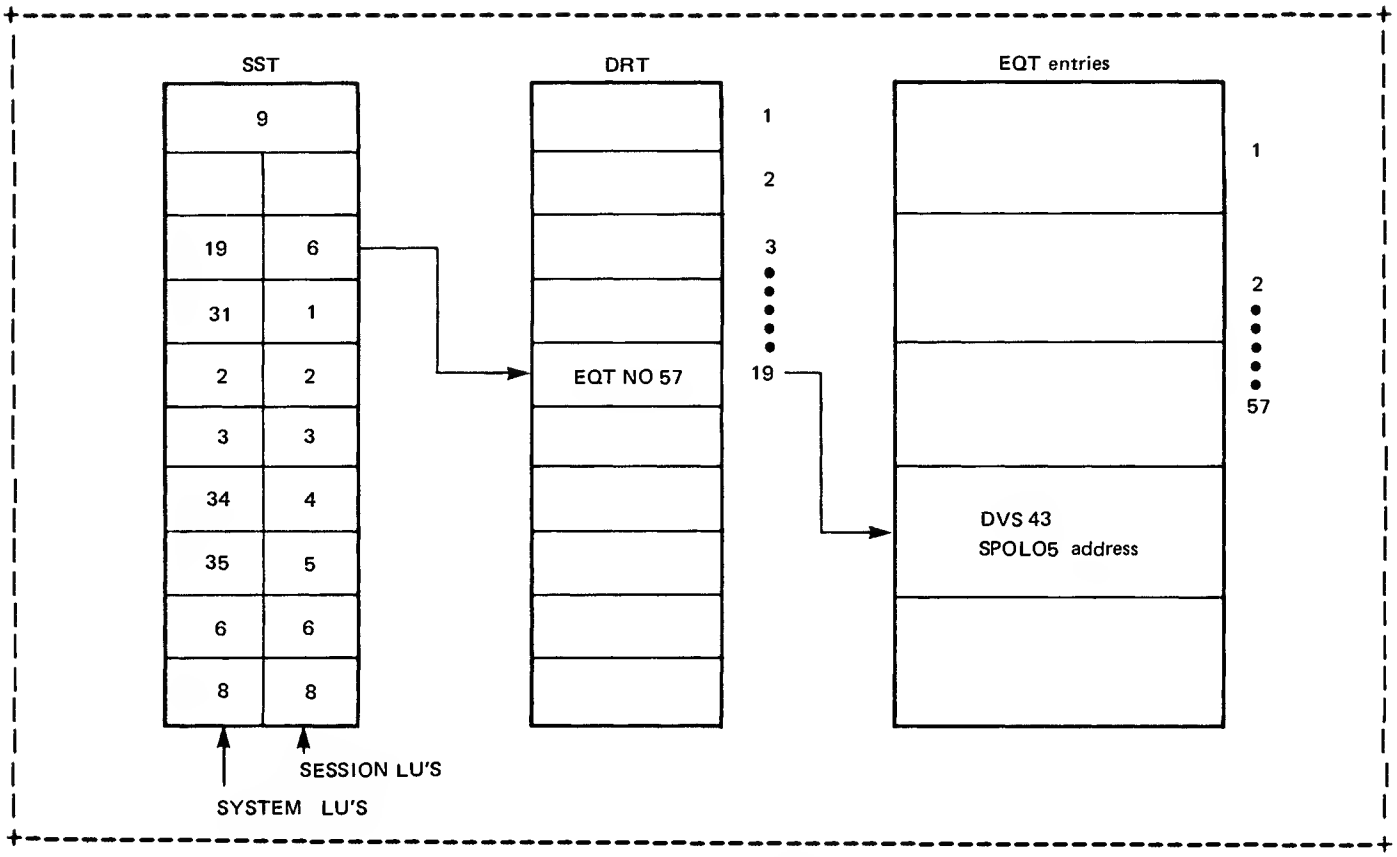

Figure 2-3. Example Session LU - Spool File Association.

Although the original SST entry for system LU 6 still exists, the SST is always scanned from the top down.

When the user now performs an output operation to session LU 6, the I/O call will reference spool LU 19, and ultimately DVS43, the spool driver. DVS43 will then call a system routine to write the data to SPOL05. Recall that the disc address of SPOL05 was stored in spool EQT #57 by the spool setup operation.

In order to outspool the data contained in SPOL05 to the line-printer, the user enters:

:CS,6 (refer to the CS - CHANGE SPOOL SETUP section)

This command will close the spool setup. The spool entry in the user's SST will be deleted, and an entry for SPOL05 will be put in the outspool queue for LU 6 in SPLCON. The spool system will now automatically schedule the SPOUT program. SPOUT will read records from SPOL05 and write them to LU 6, the line-printer.

SL — Spool Setup and Outspool Control

The :SL command specifies logical units with which spool logical units or spool files are to be associated. It also may be used to specify outspool attributes, actual output devices other than logical unit 6, and outspool priority.

This command has a session capability level of 30. If the program parameter is specified, a session capability level of 50 is needed.

It has two formats, one for display and the other for input and/or output.

The display format of the :SL command is described in the RTE-IVB Terminal User's Reference Manual.

Format

Format (output or input/output):

:SL,lu[,namr[,attribute[,outlu[,priority[,prog]]]]]

lu — The session logical unit with which a spool file is to be associated; in range 1-63 except system logical units 2, 3 (when used to reference the auxiliary disc), 5 (if in a job) or a spool logical unit, or any logical unit associated with a disc driver (DVR30, 31, 32, or 33).

namr — Name of existing file to be used as a spool file with which lu is to be associated; if omitted, system assigns a spool pool file; if set to -, lu is returned to its standard system definition, i.e., association with spool file is cleared. A logical unit may be specified for namr in a spooled job, if the SL command is used to perform an LU switch. A logical unit may not be specified for namr where a spool reference is intended.

attribute — Defines characteristics of lu, in regard to the session or job in which it is specified. Defaults are listed in the tables below. Note that since "HOLD" is a default in all cases, it cannot be specified as an attribute.

	NAMR SPECIFIED	NAMR NOT SPECIFIED
outlu specified	WRITE,HOLD,SPOOL HEADERS,SAVE	WRITE,HOLD,SPOOL HEADERS, SPOOL POOL FILE, PURGE
outlu not specified	READ,HOLD,STANDARD FORMAT,SAVE	BOTH,HOLD,STANDARD FORMAT, SPOOL POOL FILE, PURGE

Any three of the following attribute codes can be combined in any order, without delimiters, in order to override defaults:

NO NOW; queue the file for outspooling immediately. If not specified the file will be queued (if <outlu> present) when a :CS,lu command is given, an :SL,lu non-display command is given, or at the end of the session or batch job.

RE READ ONLY; file is read only.

WR WRITE only; file is for output only. EOF automatically written as the first record.

BO BOTH; same as RE WR except that an EOF is not written. Note that specifying both RE and WR does not write an EOF.

WN WRITE NOW; same as WR NO. Writes EOF at start of file, except if RE is specified also (see BO).

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	BU BUFFERED; file is buffered.
	PU PURGE; file is to be purged following outspooling (if file is not to be outspooled, it is purged when it is closed; name must be specified.
	ST standard file format.
	SH SPOOL HEADERS; file format.
priority	Outspool priority; if in session, default priority is 99. The default in a batch job is the priority of the job.
prog	If specified, program prog will be scheduled, with wait, by the spool system when the spool LU is closed. The 16-word Spool Setup buffer will be passed to prog when it is scheduled. Note that the spool file will not be outspooled, and it is prog's responsibility to properly dispose of the file.
outlu	Session Logical unit number of function code defining the system logical unit to which the spool file will be outspooled. The system logical unit associated with outlu must have been specified as an outspool destination LU during GASP initialization. If omitted the outspool file will not be output to a device. Any file can be outspooled, whether set up for read, or write, or both (the attribute of the spool file is in regard to the job in which the attribute is declared; it has no effect on the eventual outspooling of the file).

Logical Unit Assignment

The system associates a spool logical unit with the specified logical unit. The spool logical unit associated with lu can be retrieved by displaying the global parameter OS with FMGR :DP command.

The logical unit (lu) specified should correspond to the device type of the actual device for which it is intended (outlu). This is used to set up the device type to ensure that control functions and control requests are issued to the device as expected. For example, if output is to be sent to the line printer, logical unit 6 associated with the line-printer should be specified. If a logical unit specified for lu has not been associated with a particular device, magnetic tape is assumed.

lu must not be any of the following:

* logical unit 2 (system disc), or 3 (if assigned as auxiliary disc)

* any logical unit associated with a disc driver (DVR 30,31, 32, or 33)

* if in a job, system logical unit 5 (standard spool input device). If you want to use the true system logical unit 5, use an SL switch command to obtain it (e.g., :SL,50,5)

* a spool logical unit

Spool File Assignment

If namr is not specified, an available file from the spool pool files (SPOL01-SPOL80) is associated with the logical unit. If a particular file is specified, then that file is associated with lu and will be used as a spool file during spooling. The specified file must be an existing user file; :SL does not create the file. The name of the most recently assigned spool file can be retrieved by displaying the global parameter 1S with the FMGR DP command.

Attributes

If lu is to be used for output only or for output as well as input, then its attributes must be specified.

If a WR or BO spool file is set up, the file security code must match the one specified in namr. If an RE spool file is set up, the security code must match only if it is negative.

No buffering saves System Available Memory space. Generally, there is no need to request buffering with BU. Spool file headers are used rather than standard in most cases. The format makes no difference for input. Specify standard format (ST) if you want to read back the file either within the JOB or after the job.

If the file is to be outspooled only, it is better to use the spool headers format. I/O requests for the for the LU are written in the two-word header of each record. The I/O requests are actually executed on the outspool LU when the spool header file is closed.

If ST is specified, no I/O control information is written to a standard spool file (i.e., no control is passed through SPOUT). I/O requests to the LU are actually attempted to the file itself. For example, if you rewind the LU, you actually rewind the file; if you write an EOF, you write it to the file. A default EOF is written to the outspool LU when the standard spool file is closed and outspooling occurs.

If you do not want to save the user-defined spool file namr, you must specify PU. Spool pool files are never saved. The normal case is to hold the spool file for outspooling until the spool is closed. If you specify NO, the file will be placed in the outspool queue immediately.

The :SL hold attribute is not the same as the GASP hold established with the GASP CS command (see Chapter 4). The :SL hold prevents the file from being placed in the outspool queue (an entry is not made for it in SPLCON) until a :CS command removes the hold or the session

or job terminates. The GASP hold places a hold on a file already entered into the outspool queue (already listed in SPLCON), which may only be removed with a subsequent GASP command.

Outspool Logical Unit Assignment

The device to which output from spooling is to be directed must be specified with the outlu parameter, or the file will not be outspooled. The specified logical unit is not associated with a spool file or spool logical unit. Any other outspool logical unit specified at GASP initialization may be used. An octal function code that specifies an I/O function code in bits 6-10 and a logical unit in bits 0-5 can be used when a file with standard format is output; files with spool header format use the function code in the second header word. For example, the code 104B indicates punch binary on logical unit 4. The function code is equivalent to the CONWD parameter in the standard I/O EXEC calls (refer to the RTE Programmer's Reference Manual).

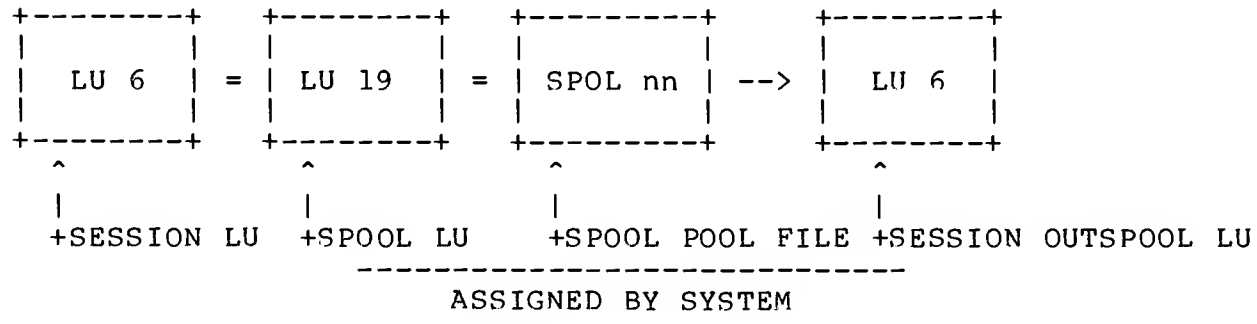
For spool header file format, if the file is to be outspooled, be careful that the proper attribute is used to indicate the file type SPOUT will actually see.

If outspool format is specified for a spool file, the validity test performed by SPOUT will usually find the error and change it to standard format; however, one or more records may be transmitted before the test fails.

1. Spool all output to the line-printer in a session:

```
      +-Session lu
      ^   +-----default attribute used
      |   ^
  :SL,6,  ,|,6
        ^   ^

        |   |actual outspool destination is line-printer
        +spool pool file used
```



2. In a session, dump file ASC to the line printer via spooling

```
  :SL,20,ASC,,6  <---Set up spool equivalence
  :CS,20 <---Close spool LU (see the CS-CHANGE SPOOL SETUP section)
```

3. Use spooling to perform formatted writes to a disc file

```
      PROGRAM WRSPL
      WRITE (45,10)     <---Program does formatted write.
   10 FORMAT ("HI THERE")
      END

      :SL,45,"TEXT,WR <--Equivalence session LU45 to existing file"TEXT.

      :RU,WRSPL       <--Run program to write message.
```

The file "TEXT now contains the ASCII string "HI THERE" as its first record.

4. Use spooling to perform a formatted read from a disc file.

```
      PROGRAM RESPL
      DIMENSION IST(39)
      READ(45,10),IST <---FORTRAN program to read a 78 character
                          message into array IST.
   10 FORMAT(39A2)
      END

      :SL,45,"TEXT <---Equivalence session LU45 to existing file "TEXT

      :RU,RESPL    <---Run program
```

Array IST in program RESPL now contains the ASCII string "HI THERE".

5. Setup a spool file in a session. When the spool LU is closed, have the spool system schedule program GETIT, which will process this file with subroutine PROC.

```
      PROGRAM GETIT
      INTEGER SETUP(16)  <---Program GETIT
      CALL EXEC(14,1,SETUP,16) <---Retrieve 16-word buffer
      CALL PROC(SETUP)                (See Chapter 3 for a description
      END                                 of spool setup buffer.)

      :SL,20,TEXT,,6,,GETIT <---ST Setup spool equivalence of existing
                                 file TEXT and session LU20
      :LL,20 <---Change FMGR list device to LU20
      :DL    <---Do a directory listing
      :CS,20 <---Close spool LU.Program GETIT is automatically
                 scheduled and processes the file.
```

6. Although the :SL command allows only one spool definition for a session LU, it is possible to define "stacked"

definitions via programmatic calls to the SPOPN routine (refer to Chapter 3). The below example illustrates this:

```
:SL,6,33 <-----Session LU6 maps to system LU33
:SL,6,,,6<-----Set up spool definition for session LU6
:RU,SPPRG<-----SPPRG sets up a spool definition for session
              LU6 via a call to the SPOPN routine.
:SL,6,,,6<-----Set up a new spool definition for session LU6
```

After the SPPRG program sets up its spool definition for session LU6, there were three entries for session LU6 in the user's SST. The first definition mapped session LU6 to system LU33. The second entry is from the second :SL command. The third SST entry for session LU6 is from the spool set up by the SPPRG program.

Since the spooled :SL command closes all spool definitions set up with <lu>, the last command in the example closed both of the spool setups for session LU6. If the user wished to only close the most recent spool definition for session LU6, a :CS,6 command could have been entered.

CS — Change Spool Setup

During a session or job, the spool options for outspooling established by the :SL command can be changed with the :CS command. The changes can include not only the outspool attributes, but the logical unit for output and the outspool priority. This command has a session capability level of 30.

The :CS command may also be used outside of a session or batch job, provided that a spool file with the given LU exists. For example, this could occur if a program sets up a spool file, then terminates (or aborts) with the spool file open.

Format

```
:CS,lu [,EN|,RW|,PU|,SA|,PA|,NB|,BU|,NP[,outlu[,priority]]]
```

Parameters

lu	Logical unit number defined by the spool set-up command :SL.
EN	Writes a final end-of-file on spool file and closes the spool; spool file is placed in outspool queue if not already there.
RW	Resets (rewinds) spool file to first record. Causes next access to be at the beginning of the first record in the file. For example, if the job is required to read a file more than once (via the spool lu), the file must be rewound before each successive read operation. This also applies if the job is required to write a file more than once (that is, overwrite a file from the beginning of the file). If the spool file is in standard format (no spool headers), this command is the same as :CS,lu,RW. If the file is setup with spool header format however, the :CN,lu,RW command will cause only a control header to be written to the file. The :CS,lu,RW command in this case will actually rewind the spool file.
PU	Changes save attribute of outspool file to purge. \ named
SA	Changes purge attribute of outspool file to save. / >files only
PA	Changes hold on spool file to pass file to outspool queue.
BU	Changes no buffer attribute to buffered for spool file.
NB	Changes buffered attribute to unbuffered for spool file.

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NP	Changes outspool logical unit and priority.
outlu	New outspool logical unit number.
priority	New outspool priority.

The :CS command can be used to change certain of the spool file attributes, either default or assigned by the :SL command. It can also be used to reset the file pointer to the beginning of the file (RW), or to write an end-of-file on the spool file and send it immediately to the outspool queue (EN).

The outlu and priority parameters are valid only if an outspool logical unit was specified when the spool file was setup.

Examples

The examples below all assume a session environment.

1. To remove a hold placed on a file associated with logical unit 6:

```
:SL,6,LIST,WR <----LU6 assigned to user file LIST for write only;
  .                 file is to be held from outspool queue and saved.
  .
  .
:CS,6,PA<----------pass file LIST to outspool queue
  .
  .
  .
:EO
```

2. In a FMGR procedure file (refer to the RTE-IVB Terminal User's Reference Manual), spool the input, list, and punch files for an assembly using existing files SOURCE, LIST, and PUNCH; list the assembly listing three times:

```
:SL,50,SOURCE<------set up assembly input file SOURCE
:SL,6,LIST,WRSH<----set up list file LIST
:SL,4,PUNCH,WR<-----set up file PUNCH for assembly output and save
:RU,ASMB,50,6,4
:CS,6,EN<-----------write end-of-file on LIST
:CA,1,1<------------use 1G as counter with initial value 1
:SL,7,LIST,,6<------set up actual logical unit for outspooling LIST
:IF,1G,EQ,3,2<------test if 1G equals 3 and skip to EOJ if so
:CA,1,1G,+,1<-------increment 1G by 1
:IF,,EQ,,-4<--------loop back including current line in count to list
:TR                 "LIST" 3 times
```

3. In a procedure file, assemble file SOURCE three times, using CS command to rewind source to beginning prior to re-assembling:

```
:SL,50,SOURCE<------equate LU50 with file SOURCE: SOURCE must exist
:CA,1,1<-----------set counter 1G to 1
:RU,ASMB,50<--------assemble SOURCE file
:IF,1G,EQ,3,3<------after three assemblies, go to end of job
:CS,50,RW<----------reset to start of SOURCE
:CA,1,1G,+,1<-------increment counter
:IF,,EQ,,-5<--------return to assemble SOURCE again
:TR
```

Outspooling

Outspooling is the process of directing output from outspool files to specified devices according to an outspool priority. The device for outspooling standard job output (list output) is the line printer. Other session or job output may be directed to other devices.

SMP makes an entry in file SPLCON for each file specified in an :SL command, and puts a notation of the spool file in the outspool queue. When that file is at the top of the queue and SPOUT is ready for it, SMP tells SPOUT to start dumping the file. The maximum record length that SPOUT can outspool is 128 words. Records longer than 128 words are truncated.

SPOUT can outspool to several devices at a time as long as there are enough spool logical units available and enough spool files allocated to the Spool System to assure that several spools to various devices can be built concurrently. As SPOUT performs its outspool functions, it communicates with SMP so that SMP can modify the status and queue information in file SPLCON. Once scheduled, SPOUT runs continuously, receiving information from SMP on the outspool files to be processed. When SPOUT is not busy, it is suspended in a Class GET call waiting for more information.

The File SPLCON contains a directory of all files to be outspooled (refer to Appendix C for SPLCON format). Entries are queued in this file according to their outspool priority. The file also keeps track of the particular status of the spool file: whether it is still in the queue waiting to be outspooled, whether it has been passed to SPOUT for actual outspooling, and whether it is being held from completion of outspooling, or is completed. When completed, the spool file is removed from the outspool queue.

The :SL and :CS commands can be used to specify the type of outspool device to be used as well as the device logical unit and outspool priority. They also specify when the file is to be placed in the outspool queue maintained in SPLCON.

Outspool Status

The state of each spool file is recorded in SPLCON when the file is opened for spooling. The states of all spool files may be examined using the GASP DS command. The possible states of spool files are:

W Wait; file is in outspool queue but is not at the top of the queue.

A Active; file has reached the top of the queue and is being outspooled.

-- File is not in an outspool queue.

In addition to these states, there are two possible hold states. A hold may be placed on a file in the outspool queue or while it is being actively outspooled. This may only be done through the GASP operator command CS (see Chapter 4). The two hold states are:

H Hold in wait status; file will not be released to SPOUT until you specifically release it with the GASP commands RS or CS (Chapter 4).

AH Active-Hold; file was being outspooled when a hold was requested with the GASP command CS; it remains suspended until released by the GASP commands RS or CS. The device to which file was being outspooled is idled until this hold is released or the file is killed or re-started.

Outspool Errors

During outspooling, if the device associated with the outspool file becomes unavailable (down), the file is placed in the active hold state and an error message is displayed on the system console:

```
SMP: LU xx DOWN filename HELD
```

where xx is the logical unit number of the down device; and filename is the name of the outspool file.

For example, the line printer has run out of paper.

To recover, determine which device is down (if necessary) using the GASP command DS to display Spool Status. Correct the problem at the device. Then use the system command UP (SYUP may be used in FMGR) to declare the device available. Next use either the GASP command RS to restart the outspool from the beginning, or CS to release the hold state of the outspool file.

If a file was being outspooled and not completed because of spool overflow, the following message is displayed:

```
SMP: LU xx EOF ER filename
```

where xx is the logical unit number of the device on which the file was outspooled and filename is the name of the outspool file.

To recover, restart the output operation with a larger file.

If an ASCII file was being outspooled and not completed because of spool overflow, the following message is output after the last record of the file:

```
BAD EOF
```

To recover, restart the output operation with a larger file.

If a file was being outspooled and one of its records exceeded 128 words, it is truncated to the maximum length of 128 words. SMP displays the following message on the system console: SMP: LU xx filename RECORD(s) TRUNCATED TO 128 WORDS. Where xx is the logical unit number of the down device; and filename is the name of the outspool file. This message is displayed only once per spool file even though there may have been more than one record truncated. If the file being outspooled is ASCII, SPOUT outputs the following message after the truncated record is written:

```
RECORD TRUNCATED
```

Outspooling process for the spool file continues after this.

Spool File Status Upon Re-Boot

The status of existing spool files when the operating system was re-booted is changed as follows:

1. If the outspool LU is not defined, then kill the spool file.

2. If the spool file was in wait status but not in the outspool queue, then the status is changed to hold. The hold bit in the disposition flag defining file characteristics is cleared. This allows the file to be placed in the outspool queue using CS or RS commands or killed using the KS command.

3. If the spool file was in the hold status, no change is performed. If the hold bit in the disposition flag defining file characteristics was set, it is cleared.

4. If the spool file was in active or active held status, no change is performed.

Batch Processing

In interactive mode, you enter the FMGR commands from an interactive device such as your session console. Interactive mode assumes that the FMGR input device allows two-way communication (teleprinters and display terminals).

As soon as it is scheduled, FMGR issues a colon prompt (:) to signal that it is ready for you to enter a command. This prompt is issued after each command is successfully completed until the EX command terminates FMGR.

The FMGR program can be scheduled to accept input from a non-interactive device.

Batch mode is entered when FMGR, not a copy of FMGR, processes a :JO command. It is normally exited when FMGR processes an :EO command, signifying the end of the job. Batch mode is used when the input device is a card reader, magnetic tape, or a FMGR file on disc. Note that an input device can be referenced as a type 0 file.

In batch mode, you must include the colon prompt (:) as the first character of the command; the system does not supply this prompt. (Refer to Figure 2-4) When a group of commands are preceded by the JO command and terminated by EO, the commands form a batch job. Batch jobs can be entered as part of a stream of jobs; all functions are performed without operator intervention and the beginning and end of each job are logged on the list device. Batch jobs are generally entered from a device such as the card reader, or they may be saved as FMGR procedure files to be entered from disc. Whether entered from a file or device, jobs may be spooled with the Spool System.

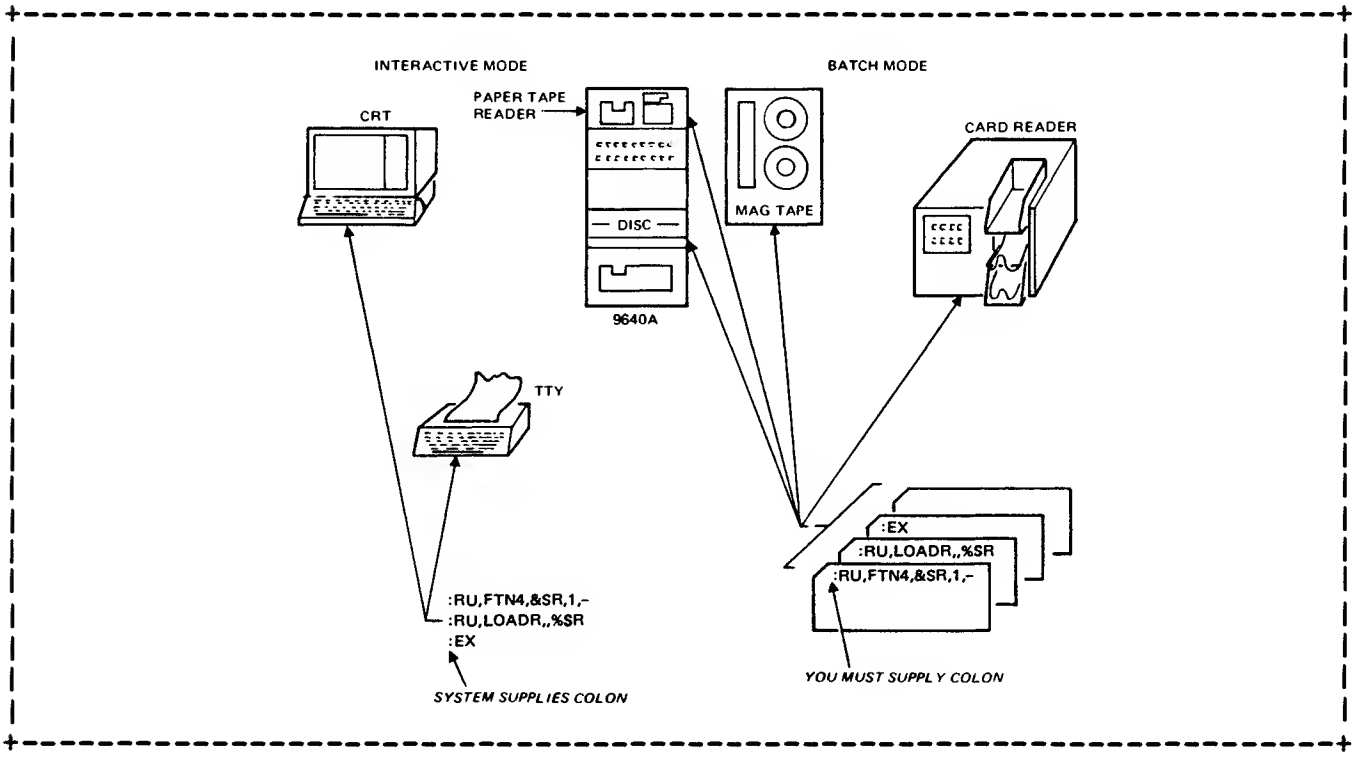


Figure 2-4 Interactive vs. Batch Operation

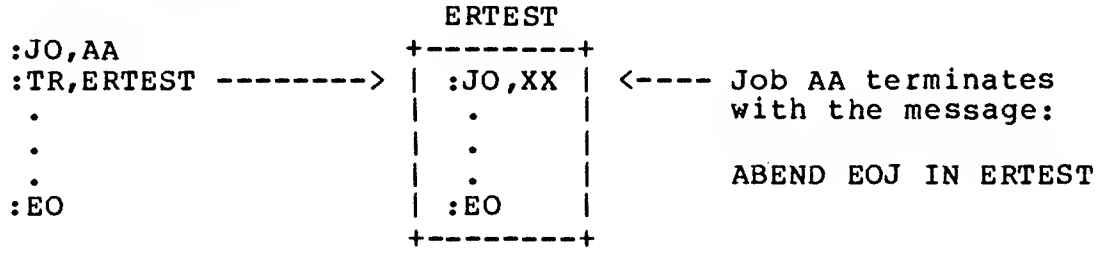
The program FMGR controls all batch operations. If an attempt is made to run FMGR interactively at the same time, the message ILLEGAL STATUS is returned to indicate that FMGR is busy. The same message is issued if FMGR is requested to run a batch job while it is being run interactively.

Normally. user's never directly schedule FMGR to process a batch job.

Program JOB is used to inspool jobs in a batch environment with spooling. FMGR then processes the jobs. This capability is explained later in this section.

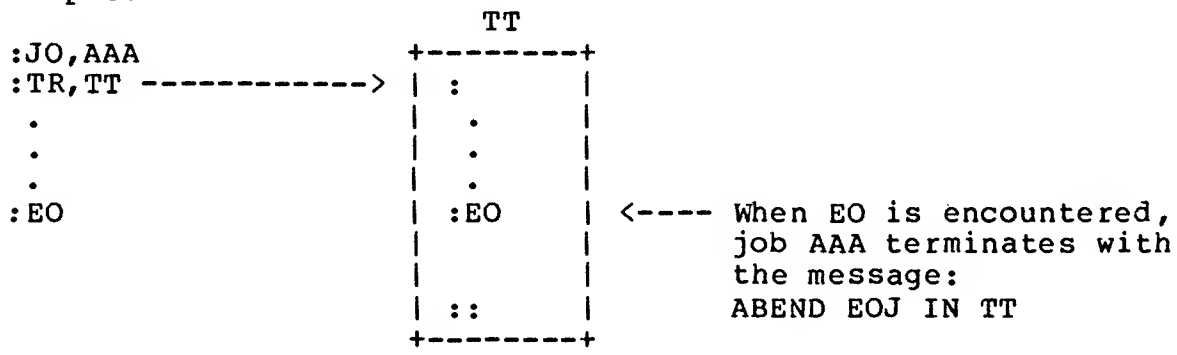
Using Procedure Files in a Job

Errors that might not occur in other environments may occur in a batch job that transfers to procedure files. For example, if a job transfers to a procedure file that contains another job, the first job is terminated as soon as it encounters the second job since jobs must not be nested.

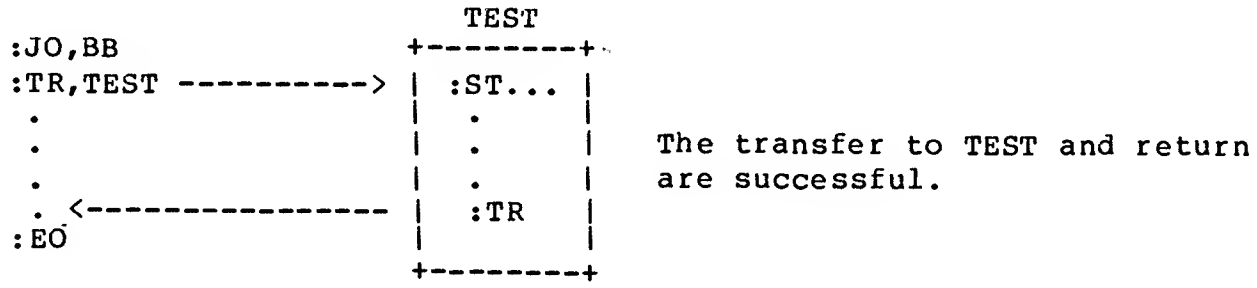


An error will also occur if the EO command is not at the same level as the JO command.

For example:



Jobs can, and often do, transfer control to procedure files. Such jobs work as long as the procedure file does not contain a JO or EO command.



Setting Severity Code

Within a job, the severity code should be set to a value greater than zero in order to inhibit command echo which is only useful in interactive mode. If the severity code is set to 4, the job will continue automatically, despite any error condition. If the severity code is set to 3, the job will continue, despite errors that require operator intervention, when the error is corrected. If set to 2, the job terminates whenever an error occurs requiring operator intervention. If set to 1, all errors are displayed but certain errors do not cause the job to terminate.

To illustrate, when an error such as FMGR -006 occurs that does not cause transfer to the log device, SV=1 causes the code to be listed at the console and the job continues executing, for SV=2, the job also continues but no error code is listed. On the other hand, if an error such as FMGR 020 occurs causing transfer of control to the log device, both SV=1 and SV=2 cause the error to be logged and the job to be terminated.

Severity code should be set at the beginning of each job with the FMGR SV command (refer to the RTE-IVB Terminal User's Reference Manual). If more that one batch job is being processed, either 1 or 2 would be useful codes so that the job terminates in case of serious error. This allows FMGR to proceed with the next job. If an operator is monitoring the jobs, then the severity of 3 is useful since it allows the job to continue after correction. A severity code of 4 allows the job to continue in any case; errors are ignored and no correction is required.

Batch Spooling

Batch processing with spooling is set up when FMGR encounters a :JO command that has been inspooled by program JOB. Batch processing with spooling involves three phases (see Figure 2-5):

* Inspooling the job
* Processing the job
* Outspooling data produced by job processing

1. Inspooling

Spooling of batch jobs is initiated by running program JOB. This program controls the phase known as inspooling. During this phase, JOB makes an entry for each job in the inspool directory file JOBFIL (refer to Appendix C for JOBFIL format). Job priority and status information is maintained in JOBFIL. Jobs entered from non-disc devices are written to disc spool files. If any jobs are already stored on disc, they are not transferred, but an entry is made in JOBFIL and the disc file becomes the job input file.

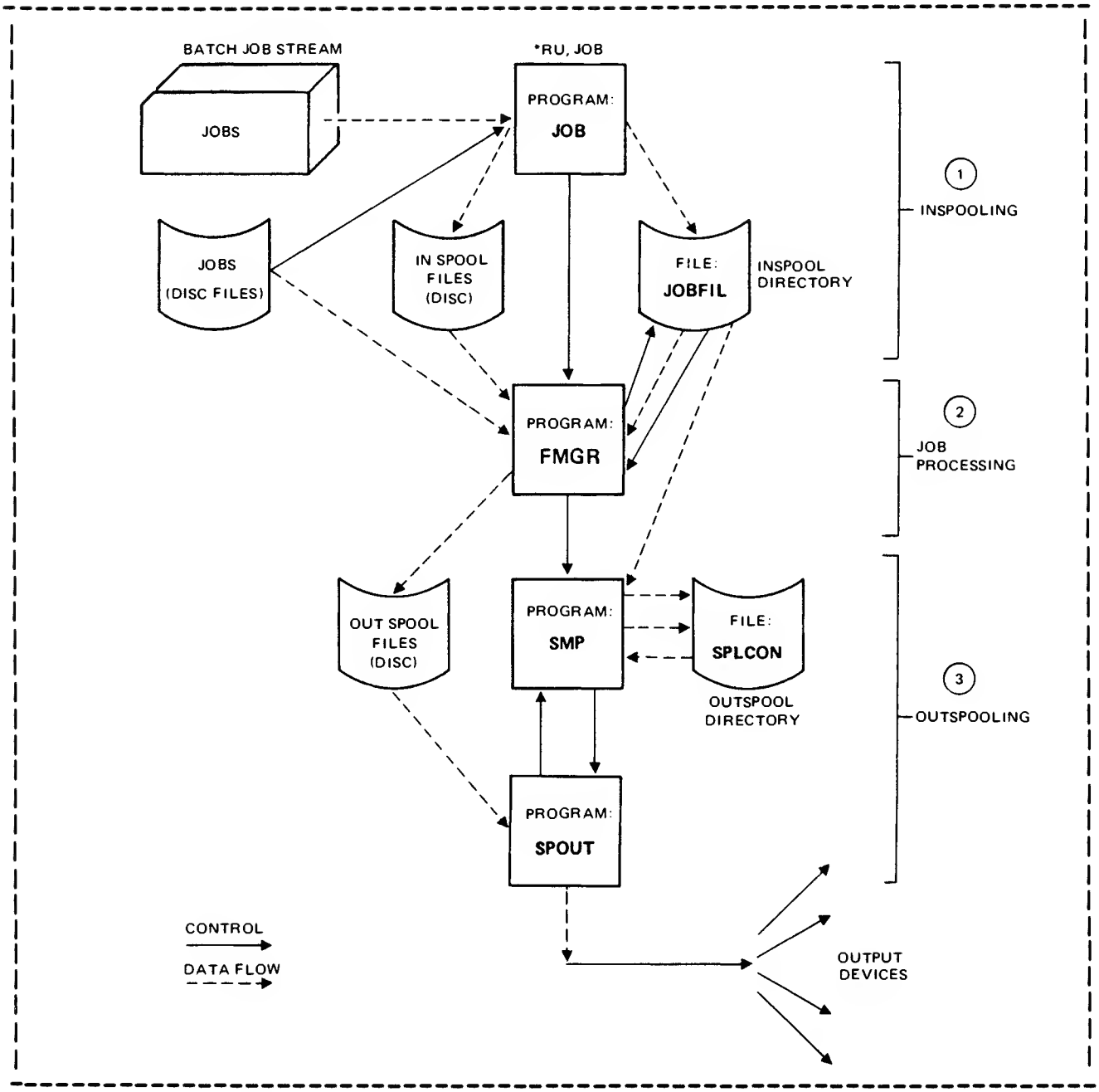


Figure 2-5. Three Phases of a Batch Job

2. Job Processing

Program JOB schedules FMGR to process jobs as soon as the first job is inspooled. If FMGR is already scheduled, it automatically checks JOBFIL for jobs to process each time it is terminated by the EX command. Each job is processed in the order of priority recorded in JOBFIL.

NOTE

FMGR, not a copy such as FMG07, is the only program that can process batch jobs.

3. Outspooling

Output from each job is usually outspooled to disc and an entry made for the output in the spool control file, SPLCON (refer to Appendix C for SPLCON format). Spooling is controlled by program SMP. SMP assigns and monitors outspool files, maintains the spool control file, SPLCON, and monitors the program SPOUT. SPOUT, scheduled by SMP, takes job output from the outspool files and directs the output to the actual devices.

Except for JOB, which you must request with the RUN command, each of these programs is scheduled internally as needed.

Program GASP

During batch spooling, you may directly intervene in the inspool and outspool processes with the GASP operator commands (refer to Chapter 4). In particular, these commands are useful to change priorities or the current status of spooled jobs or files.

Batch Setup

All batch jobs must be preceded by a :JO command and terminated by an :EO command. Certain housekeeping functions are automatically performed by the spool system at the start and termination of each job. The :JO command can also be used to set priorities for job inspooling and outspooling, and to bypass automatic outspooling so that job output may be controlled directly.

If any spool logical units are required by the job in addition to the standard input logical unit 5 and output logical unit 6, these should be specified in an :SL command within the job. :SL is used to specify which spool file to reference and how outspooling is to be performed. For instance, if you want to hold outspooling until another task is completed, this can be specified; or if you want the outspool file purged upon completion, this too may be specified with :SL. An actual output device other than logical unit 6 can be requested with :SL. If an outspool priority is needed that is different from the job priority, this too can be specified.

NOTE

The standard system logical units for input and output, LU5 and LU6, are automatically set up for spooling. LU5 must not be specified in an :SL command.

Any of the outspool attributes specified in an :SL command can be changed with a subsequent :CS command. This command would be useful, for example, to remove a hold on an outspool file that has been set by :SL.

Use of the :SL command to set up additional spools is restricted to use within a session or spooled batch job.

The :CS command may be used with any spool file that is active.

Batch Jobs In Session

When FMGR begins processing a job on a system with session installed it will call the session LOGON program to create a session for the job. A separate Session Control Block (SCB) will be built for the job from the session user account specified on the job command. If no user account is specified, the account of the session invoking the batch job is used.

When the Session Control Block's (SCB) Session Switch Table (SST) is created, the station configuration for station 1 (the system console) is used. Thus, if a job is submitted which spools to a station dependent LU, that LU must be included in the system console's station configuration. If the LU is not included, FMGR will abort with the error FMGR-040 (LU not found in SST).

When a batch job is executing, its capability to execute FMGR commands and reference I/O devices is the same as the session account it has logged on to. The batch job session is independent from the invoking session, so the user who scheduled the job may log off without affecting execution of the job.

Priority Assignment

Jobs entered in the spool system for spooling may have a priority. If they don't, priority 99, is assigned to the job. A separate priority can be assigned for outspooling, but if not assigned, the job priority is used as the outspool priority.

Job priority may be assigned by:

* the FMGR spool :JO command (interpreted when the :JO command is processed by the JOB program)

* the program JOB during inspooling if the job is on a disc file

* the JOB command :XE during inspooling if the job is on a disc file.

Outspool priority is the same as job priority unless specifically assigned by:

* the FMGR spool :JO command

* the FMGR spool :SL command

Or changed by:

* the FMGR spool :CS command.

JO — Initiate Job for Spooling

The :JO command defines the beginning of a job, optionally names the job, and defines parameters for the job. When FMGR processes a :JO command that has been inspooled by program JOB, a batch environment with spooling is set up. A session capability level of 30 is needed to execute this command. Format

```
                                                                +-  -+
                                                                | NO |
  :JOB[,name[:hr:min:sec][,user[,priority[,spool priority]|,   |]]]]
     -                                                          | NS |
                                                                +-  -+
```

Parameters

name	Job name; 6-character name specified according to file conventions.
:hr:min:sec	CPU time limit for job in hours, minutes, seconds; executing job is terminated when limit is exceeded; if omitted, jobs has no time limit.
user	Session user account ID in the form user.group/password If not specified, the invoking session user account ID is used. If a job is submitted outside of a session when session is installed this parameter must be specified.
priority	Job priority in range from 1 (highest) to 255 (lowest); if omitted, priority is 99.
spool priority	Outspool priority; same range as priority; if omitted defaults to priority.
NO	Outspool now; if not specified, the JOB's list spool is held until LU6 is reassigned, or until explicitly released, or until EOJ. May be specified anywhere after user, but must be last parameter. If set, list output spool is created automatically (but see NS).
NS	No outspooling; if present, may be specified anywhere after user, but must be last parameter; if omitted, list output spool is created automatically.

The JO command automatically performs a set of housekeeping functions for the job it initiates; it:

* terminates any previous job if EO not specified for that job.

* assigns default log logical unit for the duration of the job: log default = logical unit 1 (system console).

* clears globals 1G through 9G and 1P through 5P to null values.

* prints start of job message on list device (logical unit 6), except if NS is specified.

* assigns the list output spool to session logical unit 6, unless NS is specified.

* assigns job input spool file to logical unit 5, unless the job is entered from a logical unit specified by the :XE command in which case that logical unit is switched to LU 5 and is used for job input.

When JO is entered (and NS is not specified), it prints a start of job message on the default list device:

JOB name ON AT hr:min:sec:ms ON day month year

User Parameter

Although <user> may be any valid session account, the user account must have access to the disc file or LU where the job resides.

NO Parameter

If you don't specify NO, job output is spooled to a disc file but is not sent to the line printer (LU 6) until EOJ occurs. Or when you explicitly release the file (e.g., :CS,6,EN or :CS,6,PA). Or when you reassign LU 6. If specified, the list output is outspooled as soon as it is possible, even if the file is still open.

Note that if this parameter is specified, the batch job will lock LU6 during its execution.

NS Parameter

If you specify NS, job output is not spooled to a disc file but is sent directly to the line printer (LU 6). If the line printer is not buffered, this may slow job execution. Usually, NS is specified only if job output might overflow the disc. Log on/log off messages are not produced when NS is specified.

EO — End of Spooled Job

The EO command indicates the end of job. This command has a session capability level of 30.

Format

```
:EOJ[,RP[,RG]]
   -

      RP        Dismount job's private session cartridges
                currently mounted.  If not specified, all are
                left mounted.

      RG        Dismount job's group session cartridges
                currently mounted.  If not specified, all are
                left mounted.
```

As JO performs housekeeping functions to inialize a job, EO performs functions that terminate a job; it:

* prints an end of job message on the list device (unless NS was specified in the :JO command)
* logs its session off (main program ID segments assigned to temporary session programs will be released)
* closes all spool files
* sets job status to completed and waiting for outspooling
* if command input was from a spool pool file, returns file to pool of available files
* searches JOBFIL for next job and, if any, returns to :JO command processor.

When EO is (and NS is not specified in the :JO command), the following end of job message is printed on the list device:

```
JOB name    OFF AT hr:min:sec.ms    ON day month year

EXECUTION TIME: hr:min:sec.ms
```

TL — Set Run Time Limit

TL sets a time limit for the execution of programs within a job. This command has a session capability level of 30.

FORMAT

:TL:hr:min:sec	
Parameters	
:hr:min:sec	Time limit for execution of any programs with RU command subsequent to TL command; specified as hours, minutes, seconds each two decimal digits: if omitted, job time limit is used.

The time specified must be less than any time limit specified for the job in the JO command. TL sets this time limit for each program executed between TL and EO. If the remaining time for the job is less than the limit program execution time. If any program exceeds this limit, it is terminated and the job is aborted; RTE issues an error message.

The specified TL limit applies only to programs executed by a RU command. Actual program run time is subtracted from the remaining job time. For example, suppose the job time limit is 15 minutes and TL sets a run time limit of 5 minutes for program XX. If XX starts executing after the job has run for 12 minutes, then XX is given a run time limit of only 3 minutes, the remaining job time. If XX times out in that time, zero minutes remain of the job time, If XX starts executing after 10 minutes of job time and finishes in three minutes, then the remaining job time is two minutes (15-(10+3)).

TL, like the job time limit, limits central processor time and not the elapsed time for the program that could include waiting for an I/O device or for program swapping, or be processor time devoted to unrelated real-time tasks.

EXAMPLE:

Procedure file FORTLG:

```
:RU,FTN4,1G,6,%TEMP
:RU,LOADR,,%TEMP
:TL::5<----------------time limit for execution of 10G is 5 minutes
:RU,10G
:TR
```

Job that transfers to FORTLG:

```
:JO,RUN:::10<-----------time limit for entire job is 10 minutes
:SV,1
:TR,FORTLG,&PROGA
:EO
```

AB — Abort Job

AB terminates a job at any point within the job and performs the end-of-job housekeeping normally performed by EO. This command has a session capability level of 30.

FORMAT

```
+-----------------------------------------------------------------+
|                                                                 |
| :AB                                                             |
|                                                                 |
+-----------------------------------------------------------------+
```

Whenever there is reason to terminate a job before the normal end of job, the AB command can be specified. Any subsequent commands will be read but not processed until a JO or EO is encountered, or the card hopper is empty.

AB causes the message ABEND OPERATOR to be logged.

When an error in a job causes control to transfer to the log device and the severity code is set to 3, the job will not terminate. The operator at the log device can then correct the error and return control of the job with TR, or he may abort the job with AB.

EXAMPLES

1. In an RTE-IVB Operating System Procedure file FTNLG

```
:RU,FTN4,1G,6,%TEMP
:RU,LOADR,,%TEMP
:IF,10G,GT,0,2
:AN,**NO LOAD**
:AB<--------------------terminate if program not loaded
:RU,10G                  continue if program loaded
:TR
```

Transfer to FTNLG from job AA

```
:JO,AA
:SV,1
:TR,FTNLG,&SRCE
:EO<--------------------normal job termination
```

2. Job XX contains an error that causes transfer to the log device but does not terminate the job; if the error cannot be corrected, the job may be aborted with AB at the log device:

```
:JO,XX
:SV,3
:ST,AA,TEST<-----TEST is an existing file
  .              error causes transfer to log device---->:ST,AA,TEST
  .                                                        FMGR -006
  .              use AB to terminate job---------------->:AB
:EO
```

Running a Batch Job

Program JOB is scheduled from a copy of FMGR with the RU command.

Input to JOB may be a device (default is the standard input, LU 5), or input to JOB may be a file. If input is from a device, more than one job can be stacked on the device. When input is from a file, only one job may be on the file.

If the input device is interactive, JOB expects input to be entered from that device in the form of FMGR commands or the :XE command. It prompts for interactive input with a semi-colon.

Format

```
:RUN,JOB,namr [,priority]

Parameters

namr      File namr of file containing single job to be spooled, or
          logical unit of input device containing jobs to be spooled;
          if omitted default is session terminal if in session, or
          logical unit 5 if outside of session.

priority  Priority of job; (if on a file) if omitted, priority for
          job is taken from the job statement. If a job prioriry
          is not specified on the job statement, default is 99.
```

Job Entered From Batch Device

When namr is omitted, the jobs are expected to be on a non-disc device (LU 5) which is usually a card reader or a Cartridge Tape Unit (CRT). JOB will read input from the device until it encounters a :JO, or :XE command signalling the start of the job. (Refer to the XE - JOB INPUT CONTROL section for a description of the :XE command.) Ignoring all input prior to :JO, it then makes an entry for the job in JOBFIL, allocates a spool pool file for the job, and reads in the rest of the job, writing it to the spool pool file, until an :EO, :JO or :XE command terminates the job. At that point it closes the spool pool file and schedules FMGR to process the job. If FMGR is already scheduled, it will check JOBFIL automatically when it terminates.

After processing the first job on an input device, JOB looks for subsequent jobs. If there are none, it terminates. If there are more jobs, it processes them as it did the first job, continuing until there are no more jobs or an end-of-file is reached.

END-OF-FILE PROCESSING. If an end-of-file is encountered within a job (between :JO and :EO), it is entered in the spool file as a zero-length record. An end-of-file before or after a job terminates program JOB.

If an end-of-tape occurs on the paper tape reader within a job, program JOB suspends and the message: JOB WAIT ON PT is issued. To continue processing the job, load the rest of the job in the reader, ready the reader, and type *GO,JOB on your console. When the hopper of a card reader is empty within a job, simply add the rest of the cards and restart the reader; JOB continues reading the cards.

Job Entered Interactively

If the device specified by LU in the first format is interactive, program JOB prompts for input with a semicolon (;). You then enter your input at the terminal including any required colons. Interactive input to JOB is terminated by CTRL/D.

You may enter one or more jobs or :XE commands in the same manner as on a batch device. Processing of jobs proceeds exactly as if the job was entered through a batch device. It is often useful to store commonly used command sequences in procedure files. Then, any job may transfer to these files to do some of their work. Another method is to store often used jobs on files and use the :XE command when you want one of the jobs to be run. (refer to the XE - JOB INPUT CONTROL section for the :XE description).

CTRL/D. Entering CTRL/D in an interactive environment is like an end-of-file in a batch environment. That is, if CTRL/D is within a job (between :JO and :EO), then a zero-length record is written on the spool file. But if it precedes or follows a job, it terminates program JOB.

Job Entered From a File

When the namr parameter specifies a file, JOB expects the job to be stored on the specified file. Only one job should be on the file since FMGR will only process one job per file. :JO should be the first command, :EO the last.

JOB reads only the first line of the file to get the session user account from the :JO command. It then makes an entry for the file in JOBFIL and schedules FMGR to process the file as if it were a spool file.

Examples

1. Send output of program WHZAT to user file named MYFIL. MYFIL must already exist.

```
.
.
.RU,JOB,1                set up spool environment
;:JO,XYZ                  set up batch
;:SL,10,MYFIL,WR          associate LU 6 with MYFIL; no outspool
;:RU,WHZAT,10             run WHZAT
;:EO                      end batch
; (control D)             end spool
```

A listing of file MYFIL will show the WHZAT listing.

2. One job is on file FILEXX:

```
.RU,JOB,FILEXX,20
.
.
```

Note that a spool file is not assigned in example 2; file FILEXX is used as the spool file. In this case, the file name is the job name and priority is specified directly to JOB when it is scheduled.

3. Job CC is entered from session console:

```
.
.
.RU,JOB,1
;:JO,CC,30
;:TR,TFILE,SFILE
;:EO
;(control D)     (or next job)
```

4. If you want to enter a job interactively with input to the job from system LU5, an LU switch is needed since LU5 is redefined as a spool file by JOB:

```
.
.
.RU,JOB,1
;:JO,COMPL <------- enter job
;:SL,50,5 <-------- set up for source input from LU 5.
;:PA,1,LOAD PAPER TAPE LABELED "COMPL" IN READER
;:RU,ASMB,50,1,%REL
;:EO <------------- terminate job
D^c <-------------- terminate interactive input
```

When the job is processed, the message is printed at the system console so that the paper tape containing the source file can be loaded.

5. A job entered from any batch device (including LU5) can request input from LU5 and it will be entered correctly if the input immediately follows the request for it. To illustrate, consider the following job entered from magnetic tape (LU8) that contains a request for source input from the standard input device (LU5):

```
.RU,JOB,8 <-----job, including all input is entered from magnetic
.                tape and stored on a spool pool file
.
```

In this example, when the command following the data (first record with a ":" in column 1) is encountered, the program will receive an EOF condition. If the program tries to read data again, it will be aborted. The Batch system may then read the command and proceed with the job.

XE — Job Input Control

The :XE command indicates to program JOB that the next job to place in the job queue is on the device or file specified by :XE. :XE is used only when JOB is scheduled with input from a logical unit.

Format

```
:XE ,namr[,priority]

Parameters

namr      Indentifies input device containing a job to be placed
          in job queue, may be a logical unit or the name of an
          existing file; refer to name description in the RTE-IVB
          Terminal User's Reference Manual.

priority  Priority assigned to job; if omitted, priority is 99.
```

NOTE

When XE is used to specify job input, JOB reads the :JO command parameters (job name, priority, etc.); if input is from a file the name on the :JO command is used as the job name; if from a logical unit the job name is left blank and a job number assigned for the entry in JOBFIL.

XE Entered from Batch Device

If JOB expects input from a batch device such as logical unit 5, all jobs on the device must be delimited by :JO and :EO. The command :XE may precede a :JO or follow an :EO command to indicate to JOB that the next job is on the device or file specified by :XE.

To illustrate, three jobs are to be spooled by JOB; two are on LU5, the card reader, and one is on file AA.

```
.
.
.RU,JOB <--------- by default, input is on LU5
```

:XE Entered Interactively

If JOB expects input from an interactive device, :XE can be entered just like any FMGR command in response to the semicolon prompt issued by JOB. XE must be preceded by a colon. JOB interprets the XE command in this context exactly as if it were specified on a batch device.

For example, to enter a job from a file, XE can be used as follows:

```
:RU,JOB,1 <--------- JOB expects input from system console
;:XE,FILEXX,20 <---- enter :XE at console
;^D          (or next job)
```

This example performs exactly the same function as example 2 in "Running A Batch Job".

XE to Specify Input From a Device

So far, we have shown how :XE can be used to inspool a file. It can also be used to specify direct job input from a logical unit. If namr specifies a logical unit, JOB expects the job input to be entered from that device. For example, if logical unit 8 is assigned to magnetic tape, then the following command tells JOB that a job is on magnetic tape:

```
;RU,JOB,1
;:XE,8,10 <---------- enter XE at console; priority is 10
```

Job Status

There are four states through which a job normally progresses as it is inspooled and processed. The GASP DJ command may be used to examine the state of an inspooled job. The four normal states are:

I In spooling; job being read by JOB.

R Ready; job is at top of inspool queue and is ready to be run by FMGR.

A Active; job is being processed by FMGR.

CS Completed Spooling; job has been processed and is waiting to be outspooled.

Additional states may be specified with the GASP command CJ (see Chapter 4). If a job is ready but is not yet active, it can be suspended from further processing. This job status is:

RH Ready-Hold; a job in the ready state has been held; it will not be processed until specifically released.

GASP can also hold a job in "I" status with the CJ command. This job status is:

IH Input-Hold; a job currently being input is held. Input will compile, at which time the job will go to "RH" status.

Job Error Conditions

JOB will suspend under following conditions:

* there is no room for the job entry in JOBFIL

* only one spool file is available for the job; JOB will not use the last spool file since it might be needed for job processing.

* no spool EQT entry is available for the job; unless the job is a file, an EQT entry is needed to assign to a spool file.

No error messages are issued in these cases. The program suspends and will restart automatically when resources become available. If you are not sure what has happened, use the RTE STATUS command (ST,JOB) to find out if JOB has suspended. If it has, you should wait and try again. When other spooled jobs are complete, their spool files and entries in JOBFIL and the EQT table are released automatically and JOB will continue as soon as the necessary resources become available.

Table 2-1 lists the error messages that may be received during JOB execution.

Table 2-1. JOB Error Messages

MESSAGE	CAUSE	CORRECTIVE ACTION
JOB WAIT ON PT	End-of-tape occurs between :JO and :EO commands.	Load remainder of job in reader, ready the reader, and enter GO,JOB.
JOB WAIT ON SPOOL RESOURCE	Required spool file or logical device cannot be obtained at this time.	None required. JOB will suspend and be automatically rescheduled when the resource becomes available.
JOB WAIT ON EXTENT	Spool file overflows available disc space.	Condition will automatically clear when SMP releases spool files as a result of outspool completion; you can force a retry using the GASP command, SU; or you can abort JOB.
END JOB ABNORM	JOBFIL could not be opened; or other uncorrectable error occurred; or JOB was run before Spool initialization.	Try re-initialization with GASP after all spool activity is completed.

Chapter 3
Spool Control Through SMP Calls

INDEX TO SMP CALLS

Routine Name	SMP Request Code	Call Format	Function	Page
SPOPN	--	CALL SPOPN(IBUFR,ISLU)	Setup spool file	3-3
EXEC	1	CALL EXEC(23,ISMP,1,ISLU)	Change purge to save	3-9
EXEC	2	CALL EXEC(23,ISMP,2,ISLU)	Change save to purge	3-10
EXEC	3	CALL EXEC(23,ISMP,3,ISLU)	Queue for outspooling	3-10
EXEC	4	CALL EXEC(23,ISMP,4,ISLU)	Close and queue for outspooling	3-11
EXEC	5	CALL EXEC(23,ISMP,5,ISLU,NULU,NPR)	Change spool options	3-12
EXEC	6	CALL EXEC(23,ISMP,6,ISLU)	Set buffer flag	3-13
EXEC	7	CALL EXEC(23,ISMP,7,ISLU)	Clear buffer flag	3-14
EXEC	8	CALL EXEC(23,ISMP,8,ISLU)	Retrieve record position	3-15
RMPAR	--	CALL RMPAR(IPRAM)		
EXEC	9	CALL EXEC(23,ISMP,9,ISLU,ISEC, IOFST,IEXT)	Change record position	3-15

Commonly Used Parameters	
IBUFR	16-word array used as setup buffer for SPOPN; used to setup spool control record in SPLCON file and to setup spool EQT entry.
ISLU	1-word integer variable containing spool logical unit number; returned by SPOPN used as input to EXEC calls.
ISMP	3-word array containing name of program SMP.

Introduction

The calls described in this section provide a means to spool output from a program and to read input from a file through ordinary I/O EXEC calls. The batch job processing capabilities of FMGR are not used. These calls may be used outside of a session environment. The spool calls establish an equivalence between a device logical unit in a standard I/O request and a spool file on disc. The user communicates directly with the spool system to set up the spool files. This is similar to using the FMGR :SL command. The outspool program SPOUT automatically sends the actual output to an external device for spool files set up by the user as outspools.

The SMP calls provide a means to perform formatted I/O to or from a disc file. By establishing an equivalence between the logical unit number in an EXEC call or a formatted I/O call and the spool file on disc, formatted data may be read from or written to a disc.

Without spooling, standard EXEC calls or formatted I/O calls can tie up a device until all I/O is complete. When spooled through the SMP calls, program output can continue, and the program need not be suspended while waiting for an output device.

The SMP calls fall into three general categories:

- Spool Setup -- activate files for spooling and establish logical unit equivalence
- Spool Control -- assign or change spool attributes
- Spool Position -- retrieve or change record position in spool file

The first two categories are similar in function to the FMGR :SL and :CS commands that also establish logical unit equivalence and assign or change spool attributes. The last category performs functions similar to the FMP calls LOCF and APOSN; they allow positioning within a spool file. You can thus perform these file management functions without using the FMGR or FMP calls.

NOTE

In this manual only FORTRAN IV calls are shown; Assembly Language calls could also be used.

Spool Setup

Spool setup in which spool files are defined and opened, is performed by a call to the routine SPOPN. The spool files must be user-defined files; they cannot be files from the pool of spool files (SPOL01 through SPOL80). The spool files for use with the SMP calls must exist before calling SPOPN, but they must not be open since program SMP (called by SPOPN) opens the file it sets up.

Setup with SPOPN

A single call to the routine SPOPN takes a setup buffer established by the user to define the spool file and passes this buffer to SMP. Following the call to SPOPN, the spool file is open. The spool logical unit associated with the spool file is returned in a SPOPN parameter. This session logical unit translates via the user's SST (if in session) to a system logical unit that is one those associated with a spool EQT at generation; SPOPN causes SMP to set up the spool EQT entry.

Format

```
CALL SPOPN(IBUFR,ISLU)

IBUFR  Setup buffer; 16-word array defining spool file, spool
       attributes, spool priority, and outspool device.

ISLU   Spool logical unit number assigned by SMP returned here.
```

Spool Control Through SMP Calls

A spool setup must be established for each logical unit in your program to which you want to assign a spool logical unit equivalence. When SMP is scheduled by this subroutine, it establishes a record in file SPLCON (see format in Appendix C). Recall that SPLCON contains a record for each spool file currently active or queued for spooling. An EQT number is initialized for the spool and its corresponding spool logical unit is assigned. SMP passes back a non-zero logical unit number in ISLU if the call is successful. ISLU is set to a negative error code if the call is unsuccessful (see Appendix B).

Setup Buffer

You must set up IBUFR as described in Table 3-1. SMP adds the spool logical unit and status to the 16-word array IBUFR and writes it to a record in SPLCON.

This buffer establishes the file to be used for spooling and is used by SMP as the spool control record in file SPLCON. The user file is specified in words 2, 3, and 4, and this file must exist before it can be used by SMP.

Batch Checking

Batch checking is not normally requested by user programs. If batch checking is requested, only the program making this call may read records starting with a colon (:) from the user file defined in words 2,3 and 4 of IBUFR. If any other program attempts to read such a record, it will get an EOF on the first attempt and be aborted (error code I022) on any subsequent attempts. Batch checking is normally set by program FMGR to prevent other programs from reading FMGR commands, in a job stream.

Disposition Flags

The disposition flags are similar to the attributes specified in an :SL command or changed by :CS. If the entire word is set to zero, then the following default disposition is assumed: the file is unbuffered, input is not from batch job; both read and write are allowed, spool file is formatted with two-word spool record headers, file is a user file; it is passed to outspool queue, and is purged when spooling is completed. The main difference between these attributes and those assumed by :SL is that SMP assumes a user file as the spool file in this case, assumes that both read and write are allowed, and purges the file upon completion of outspooling.

Table 3-1. IBUFR Format

WORD	CONTENTS
0	Batch input checking flag; not=0 if batch input checking wanted; .= 0 if no batch input checking. When the flag is set, SMP places the calling program's ID segment address in word 0 when IBUFR is moved to SPLCON.
1	If program is under session, then if word 1: >0 then it is the session lu for the spool file. =0 then program SMP will allocate a session lu for the spool file. SMP will scan the entire Session Switch Table (SST) to find the largest available Session lu less than 64. =-1 then a direct map to the system lu is to be set up for the spool file. In this case there must be spool lu's less than 64 defined at generation time. If program is not under session then this word is the spool logical unit number set by SMP when IBUFR is moved to SPLCON. Do not set or set to zero.
2,3,4	6-character file name of user file to be used for spooling; may not be a spool pool file (SPOL01 through SPOL80).
5	Security code of file; set to value associated with file at creation; if no security, set to zero.
6	Cartridge reference number of cartridge containing file; set to value assigned to file at creation; if no cartridge specified, set to zero.
7	Octal number of device type for outspool device; i.e., if deviced is line printer (driver DVR12), set to 12B. This number is placed in the EQT table so that programs testing the device type will find it. If the spool is to be accessed by the Formatter with binary reads or writes, the type should be greater than 17B. If positioning such as back-spacing is to be done, it may be set to 23B (magnetic tape). Refer to Appendix C for a complete list of driver types.

CONTINUED NEXT PAGE

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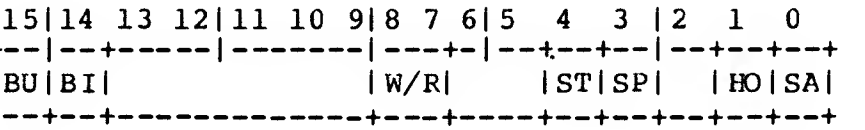
8	Disposition flags defining spool file characteristics as follows:



BU = 1 if buffering; = 0 if no buffering; there is generally no need to request buffering. If buffering is specified spool I/O abort errors will not be returned to calling programs using the error return option in EXEC calls.

BI = 1 if batch input (FMGR procedure file); = 0 otherwise (you should set to zero).

W/R = 10 for write only; 01 for read only; 00 for write/read.

ST = 1 if standard file format; = 0 if spool file format (spool format is recommended if the file is to be outspooled as it retains all control requests).

SP = 1 for spool pool file; = 0 for user file (do not set to 1, must be user file).

HO = 1 to hold outspooling until file is closed; = 0 to pass to outspool queue immediately (only useful if word 15 set to an outspool logical unit). You should set HO = 1 if you expect to re-position the file to be outspooled.

SA = 1 to save file; = 0 to purge file (this action is taken when file is closed or, if queued for outspooling, when outspooling is complete).

9	Spool priority (1-9999) used to determine priority for outspooling; if set to zero, 9999 is assumed; used only if word 15 is set to an outspool logical unit.
10	a. If the file is not to be outspooled this word is ignored. b. Null H (110_8) the file is put in HOLD status, the same as if a CS,,H command had been issued by GASP. This "operator" hold may only be removed by the GASP CS command. c. If word 10 is not null H (110_8) then the file is put in R status and will be outspooled as soon as the HO bit is cleared in word 8 either by the initial set up or by the "Write EOF and queue for outspooling" or the "Queue for outspooling" request.

CONTINUED NEXT PAGE

TABLE 3-1. IBUFR FORMAT CONTINUED

11	If program is running batch: bit 15 = 1 bit 0-14 = job number This word is set by the FMGR. If program is not under batch: bit 15 = 0 bits 0-14 = 0 if program is not under session = directory entry number of session program it is running under. This word is set by SMP.
12-14	Set to zeros, or program parameter of :SL command.
15	Set to outspool session logical unit; set to zero if no outspooling is desired at this time; a logical unit may be assigned later in the program.

Example

Set up to spool on the user file MYFILE (security code SC, cartridge 13) with outspooling to the line printer (logical unit 6, DVR12). The file is for write only, and is to be saved. The spool logical unit is retrieved in ISLU:

```
                                                    set values
      DIMENSION IDCB(144),IBUFR(16),FNAME(3)        for CREAT--+
      EQUIVALENCE(ISECU,IBUFR(6)),(ICR,IBUFR(7)) <------------|
      DATA FNAME/2HMY,2HFI,2HLE/,ISIZE/20/,ITYPE/3/ <----------+
      DATA IBUFR/0,0,2HMY,2HFI,2HLE,2HSC,13,12B,401B,10,
     1   0,0,0,0,0,6/
                                                 |---values for setup buffer
      .
      .
      .
      CALL CREAT(IDCB,IERR,FNAME,ISIZE,ITYPE,ISECU,ICR) <----+
      IF(IERR .LT. 0) GO TO 900 <-- create user file MYFILE--|
      CALL CLOSE(IDCB) <---------- close file before calling SPOPN
      CALL SPOPN(IBUFR,ISLU) <----- set up MYFILE as spool file
      IF(ISLU .LT. 0) GO TO 900 <-- check for successful completion
      .                            of SPOPN
      .
      .
      WRITE(ISLU,200)
200   FORMAT("THIS OUTPUT IS SPOOLED")
      .
      .
      .
     CALL EXEC(23,5HSMP   ,4,ISLU) <---close spool file
900  (error processing starts here)
```

Spool Control

A set of EXEC calls to schedule program SMP may be used to assign new values for spool control. They assume that spool control values have been specified in IBUFR and that a setup call has been used to move IBUFR to the file SPLCON and set up the spool EQT.

The calls have a general form:

```
CALL EXEC(23,ISMP,n,ISLU)
```

where n is the request code for the procedure. The request code for spool setup is zero; the request codes for calls in this group range from 1 through 7. The call using request code 5 has two additional parameters, otherwise they follow the general form exactly.

ISMP is a three-word array containing the program name SMP

ISLU is the non-zero spool logical unit number returned by the spool setup call, SPOPN; ISLU <0 if the setup failed.

After each SMP call, any error code can be checked for by calling the relocatable library routine RMPAR (refer to the DOS/RTE Relocatable Library Reference Manual 24998-90001).

If an error occured, the first parameter retrieved by RMPAR will contain the negative value of the error code.

Table 3-2 summarizes the spool control functions.

Table 3-2. Spool Control Calls

FUNCTION	REQUEST CODE
Change purge to save	1
Change save to purge	2
QUEUE for outspooling	3
Write EOF and queue for outspooling	4
Change spool options	5
Set buffer flag	6
Clear buffer flag	7

Once you have set up the IBUFR array with default values these calls permit you to change them dynamically during execution of your program. In this way, IBUFR need not be completely re-specified for each new spool setup as long as the same spool file is used. All output to the same logical unit goes to the same file.

Change Purge to Save

This call saves the spool file following outspooling.

Format

```
+-----------------------------------------------------------------+
|                                                                 |
|  CALL EXEC(23,ISMP,1,ISLU)                                      |
|                                                                 |
|  ISMP  Program name SMP.                                        |
|                                                                 |
|  ISLU  Spool logical unit number returned by setup request.     |
|                                                                 |
+-----------------------------------------------------------------+
```

Example

To set a flag in IBUFR to save FILEX:

```
DIMENSION IBUFR(16),ISMP(3)
DATA IBUFR/0,0,2HFI,2HLE,2HX ,0,0,12B,0,0,0,0,0,0,0,0/
DATA ISMP/2HSM,2HP ,2H  /
.                                        |------- define IBUFR with
.                                                 default values in
.                                                 disposition flags
CALL SPOPN(IBUFR,ISLU) <----------- setup spool on user file FILEX
IF(ISLU .LT. 0) GO TO 900
.
.
.
CALL EXEC(23,ISMP,1,ISLU) <-------- set flag to save FILEX
```

Change Save to Purge

This call causes the spool file to be purged following outspooling.

Format

```
+-----------------------------------------------------------------+
|                                                                 |
|  CALL EXEC(23,ISMP,2,ISLU)                                      |
|                                                                 |
|  ISMP  Program name SMP.                                        |
|                                                                 |
|  ISLU  Spool logical unit number returned by setup request.     |
|                                                                 |
+-----------------------------------------------------------------+
```

Since the default is to purge the spool file, this call is only meaningful if the save flag has been set in IBUFR.

Example

Assume the save flag has been set in IBUFR; to purge spool file FILEX:

```
DIMENSION IBUFR(16),ISMP(3)
DATA IBUFR/0,0,2HFI,2HLE,2HX ,0,012B,1,0,0,0,0,0,0,0/
DATA ISMP/2HSM,2HP 2H  /
                                     |-------- save flag is set
.
.
.
CALL SPOPN(IBUFR,ISLU) <------------ set up spool file and return
IF (ISLU .LT. 0) GO TO 900           spool logical unit
.
.
.
CALL EXEC(23,ISMP,2,ISLU) <--------- set flag to purge FILEX
```

Queue for Outspooling

This call releases a hold from a spool file so that it may be outspooled.

Format

```
+-----------------------------------------------------------------+
|                                                                 |
|  CALL EXEC(23,ISMP,3,ISLU)                                      |
|                                                                 |
|  ISMP  Program name SMP.                                        |
|                                                                 |
|  ISLU  Spool logical unit returned by setup request.            |
|                                                                 |
+-----------------------------------------------------------------+
```

If the file is already in the queue to be outspooled, the call is ignored. The call is intended to release a hold placed on a spool file by the hold flag in word 8 of IBUFR.

Example

When the hold flag is set in IBUFR, to release the hold:

```
DIMENSION IBUFR(16),ISMP(3)
DATA IBUFR/0,0,2HFI,2HLE,2HX ,0,0,12B,2,0,0,0,0,0,0,0,6/
DATA ISMP/2HSM,2HP 2H  /
                                        |-------- set hold flag on FILEX
.
.
.
CALL SPOPN(IBUFR,ISWLU) <---------------------- setup spool file
IF (ISLU .LT. 0) GO TO 900
.
.
.
CALL EXEC(23,ISMP,3,ISLU) <-------------------- release hold on FILEX
```

Close and Queue for Outspooling

This call closes the spool file to LU association and then places the file the queue for outspooling. This call must be used for each opened spool file in order to properly close the file. The spool LU is no longer connected to the spool file when this call is completed.

Format

```
CALL EXEC(23,ISMP,4,ISLU)

ISMP  Program name SMP.

ISLU  Spool logical unit number returned by setup request.
```

After all output has been written to the spool file, this call ends the file spool and places the file in the outspool queue if an outspool LU was specified. If the file is already queued for outspooling or is being outspooled, or no spool LU was given, the association is ended but the queue request is ignored. In any case, the call must be used to close an opened spool file. A spool file may only be outspooled once.

Example

Assume that IBUFR has been set up exactly as shown in the preceding example, after writing data to the spool file, to then write an EOF and outspool it:

```
     CALL SPOPN(IBUFR,ISLU) <------------- setup spool file
     IF(ISLU .LT. 0)GO TO 900
     .
     .
     .
     WRITE(ISLU,200),(DATA(I),I=1,5) <----- write data to spool file
200  FORMAT("DATA:",5(G10.3))
     CALL EXEC(23,ISMP,4,ISLU) <---------- close file and outspool it
```

Change Spool Options

This call changes an outspool logical unit and an outspool priority.

Format

```
CALL EXEC(23,ISMP,5,ISLU,NULU,NPR)

ISMP  Program name SMP.

ISLU  Spool logical unit returned by setup request.

NULU  Session logical unit of output device, (if program under
      session) If NULU=0, current outspool LU remains unchanged.

NPR   Priority for spool file in outspool queue.
```

A driver type should always be specified in IBUFR corresponding to the actual device to which output is sent. (Refer to Appendix C for a list of driver types). The logical unit specified in NULU should be the driver type specified in IBUFR; that is, a line printer logical unit if a line printer driver type was specified, a magnetic tape logical unit if a magnetic tape driver type, and so forth. In the examples in this section, a driver type is always specified in IBUFR and is usually DVR12 (12B), the line printer driver.

Set Buffer Flag

Data transmitted to or from spool files may be buffered or unbuffered. This call sets a flag in the spool EQT table to specify buffering.

Format

```
CALL EXEC(23,ISMP,6,ISLU)

ISMP  Program name SMP.

ISLU  Spool logical unit returned by setup request.
```

Ordinarily buffering of spool files is not recommended. Buffering moves data to a system buffer in memory and thus adds overhead to spooling. However, when a foreground program is spooling, buffering is useful in order to insure that it can be swapped and thus avoid conflicts with the foreground program D.RTR used by the Spool System to create spool file extents. This conflict can also be avoided by using calls to REIO (re-entrant I/O) for input and/or output (refer to the RTE-IVB Programmer's Reference Manual).

When buffering is used, I/O abort errors are not returned to calling programs using EXEC calls with the error return option.

Example

If IBUFR is specified with the buffer flag set to zero, to setup a spool file and request buffering:

```
DIMENSION IBUFR(16),ISMP(3)
DATA IBUFR/0,0,2HFI,2HLE,2HX ,0,0,12B,0,0,0,0,0,0,0,0,6/
DATA ISMP/2HSM,2HP ,2H  /
.                                    |---- disposition flags all zero
.
.
CALL SPOPN(IBUFR,ISLU)     <---------------- setup spool file
IF(ISLU .LT. 0)GO TO 900
CALL EXEC(23,ISMP,6,ISLU)  <---------------- set flag to buffer file
```

Clear Buffer Flag

If spool file buffering has been specified, the buffer flag in the EQT table can be cleared with this call.

Format

```
+-----------------------------------------------------------------+
|                                                                 |
|  CALL EXEC(23,ISMP,7,ISLU)                                      |
|                                                                 |
|  ISMP  Program name SMP.                                        |
|                                                                 |
|  ISLU  Spool logical unit returned by setup request.            |
|                                                                 |
+-----------------------------------------------------------------+
```

Example

Assume the buffer flag has been set; to clear the flag:

```
CALL EXEC(23,ISMP,7,ISLU)
```

Spool Positioning

Data is read from or written to spool files one record at a time. The position of the record currently being written or read can be retrieved with one SMP call; another call may be used subsequently to reposition the file to the record position saved in the first call.

Retrieve Record Position

This call retrieves the current record position in the spool file. The information must be retrieved by a subsequent call to RMPAR.

Format

```
CALL EXEC(23,ISMP,8,ISLU)

CALL RMPAR(IPRAM)

ISMP   Program name SMP.

ISLU   Spool logical unit returned by spool setup request.

IPRAM  5-word array containing pointers to record position:
              --+
       word 1 = |
                | contain an internal coding of the current
       word 2 = | position (position vector) of the referenced
                | file
       word 3 = |
              --+
       word 4 =  not used but should be included in array

       word 5 =  not used but should be included in array
```

The information retrieved in IPRAM can be used in the next spool call to (see next paragraph) position the disc at the indicated position.

Change Record Position

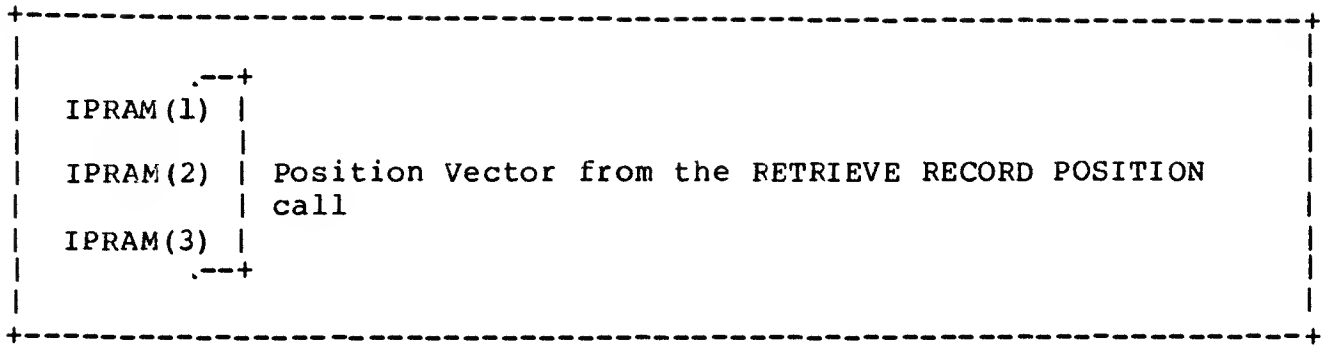
This call positions the spool file at a particular record indicated by its position vector. This information can be retrieved by the previous SMP call (Retrieve Record Position).

Format

```
CALL EXEC(23,ISMP,9,ISLU,IPRAM(1),IPRAM(2),IPRAM(3))

ISMP  Program name SMP.

ISLU  Spool logical unit returned by setup request.
```



In order to use this call, retrieve the location of the current record by a previous EXEC call and call to RMPAR, and save this information so it can be used in the call to change the record position. The information specified in this call must have been obtained in the current setup of the file.

Example

This example illustrates both the record retrieval and positioning calls. To save the location of current record (when data value is -1); then reposition to the saved location (when data value is -2):

```
      DIMENSION IBUFR(16),ISMP(3),IP(5),DATA(5)
      DATA IBUFR/0,0,2HOU,2HTF,2HIL,RT,13,12B,403B,10,6*0/ <--
      DATA ISMP/2HSM,2HP ,2H  /          define IBUFR --------|
        .
        .
        .
      CALL SPOPN(IBUFR,ISLU) <--------- Setup spool file OUTFIL
      IF (ISLU .LT. 0)GO TO 900
        .
        .
        .
   22 READ(1,*)(DATA(I), I=1,5) <------ read data from lu 1
      IF (DATA .EQ. 0)TO TO 50           terminate on zero input
      IF (DATA .NE. -1)GO TO 24
      CALL EXEC(23,ISMP,8,ISLU) <--- get current record position vector
      CALL RMPAR(IP)

   24 IF (DATA .NE. -2)GO TO 26
      CALL EXEC(23,ISMP,9,ISLU,IP(1),IP(2),IP(3) <---- reposition file
   26 WRITE(ISLU,200)DATA                <----- write data to spool file
  200 FORMAT(" DATA  :", 5(G10.3))
      GO TO 22
   50 (end-of-data termination)
```

Spool Call Example

The program SPOLX illustrates an application of SMP calls. The program reads data from logical unit 1 and writes it to a spool file. The data is monitored so that when a value indicates a change of state, the next record location is saved and at a second value, the record is re-written from that location. When there is no more data, then the file is closed, an end-of-file is written to it and it is placed in the outspool queue. The file is saved and its contents can be printed at any time.

The particular use for such an application is in situations when data comes in at a relatively slow rate and where the data must be monitored so that only "good" data is written to a device. If the process is monitored over long periods of time, this would make the output device unavailable to other users during that time. This problem can be alleviated by writing to FMP files or, as in this example, by outspooling to a spool-maintained file. The advantage of spooling is that I/O can be handled by standard EXEC calls or formatted I/O calls and the file physically outspooled to the device at some later time.

The program is scheduled with:

```
RU,SPOLX,P1,P2,P3,P4
```

where

p1 is the input logical unit

p2-p4 is the name of the data file to be spooled

When the program has completed, the results can be physically outspooled to the line printer by running the following job:

```
   :JOB,DUMP,,NS
   :SL,51,FILENM,,6
   :EOJ
        |--- 51 is any dummy value following constraints of SL command
```

```
C
C
      PROGRAM SPOLX,3,99
C
      DIMENSION IRTNBF(5),IPRAM(5),ISMP(5),IOCB(144)
      DIMENSION DATA(5),ISET(16)
      INTEGER FNAME(3)
C
      EQUIVALENCE (LU,IPRAM)
      EQUIVALENCE (FNAME,ISET(3))
      EQUIVALENCE (ISECU,ISET(6)),(ICR,ISET(7))
C
      DATA ITYPE/3/,IBCHK/0/
      DATA ISMP/2HSM,2HP ,2H  /
      DATA ISET/0,0,2HOU,2HTF,2HIL,2HRT,13,12,403B,10,
     1          0,0,0,0,0,0/
C
C
      CALL RMPAR(IPRAM)
      IF(LU.EQ.0)LU=1
C
C
C     CHECK SCHEDULE PARAMETERS FOR A FILE NAME
C
         IF(IPRAM(2).EQ.0)GO TO 12
         FNAME=IPRAM(2)
         FNAME(2)=IPRAM(3)
         FNAME(3)=IPRAM(4)
C
C     CREATE OUTPUT FILE (10 BLKS - IT'LL BE EXTENDED IF NECESSARY)
C      ALSO, PURGE OLD VERSION IF NECESSARY
C
  12     CALL PURGE(IDCB,IERR,FNAME,ISECU,ICR)
         ISIZE=10
         CALL CREAT(IDCB,IERR,FNAME,ISIZE,ITYPE,ISECU,ICR)
         IF(IERR.GE.0)GO TO 15
         WRITE(LU,101)IERR
 101     FORMAT("/SPOLX: FILE CREATE ERROR:"I5)
         GO TO 999
  15     CALL CLOSE(IDCB,IERR,0)
C
C           NO BATCH INPUT CHECK
C           TO FILE SPECIFIED ON CR 13, SC = "RT"
C           DRIVER TYPE 12 SINCE WE INTEND TO LIST ON L.P. LATER
C           ATTRIBUTES OF: SAVE, HOLD, WRITE ONLY
C           PRIORITY 10
C           OUTSPOOL LU: 6
```

```
C
C     (SEE DATA STATEMENT FOR PRE-SET VALUES)
C
         CALL SPOPN(ISET,LUSPOL)
         IF(LUSPOL.GT.0)GO TO 20
         WRITE(LU,110)LUSPOL
 110     FORMAT("/XPOLX: SPOOL SET-UP ERROR, ABORT!"I4)
         GO TO 999
C
C     ISSUE TOP-OF-FORM TO THE OUTPUT
C
  20     ICNWD=LUSPOL+1100B
C
         CALL EXEC(3,ICNWD,-1)
C
C
C     NOW, START DATA INPUT, PROCESSING, AND OUTPUT TO THE SPOOL
C      THIS SECTION WOULD BE REPLACED BY A MORE FUNCTIONAL
C      SET OF CODE UNDER USUAL CIRCUMSTANCES
C
C      IN THIS EXAMPLE WE WILL MAKE USE OF THE FIRST DATA ITEM IN THE
C      LINE OF FIVE TO SIGNAL THE PROGRAM IN THE FOLLOWING MANNER:
C
C      =  0   TERMINATE
C
C      = -1   FLAG AS START OF `CHANGE POINT'.  E.G. THE TEST OR
C               PROCESS IS BEING ALTERED AND IS NO LONGER IN
C               EQUILIBRIUM.  DATA IS GOOD FOR LOGGING ONLY, AND NOT
C               GOOD FOR PERFORMANCE RESULTS FOR THE PROCESS.
C
C      = -2   OVER-WRITE DATA FROM `CHANGE POINT'.  E.G. THE LOGGED DATA
C               IS NO LONGER NECESSARY AND THE FILE SHOULD CONTAIN ONLY
C               GOOD PERFORMANCE DATA.
C
C      = -3   THE OUTPUT DEVICE IS NOW AVAILABLE.  START OUTPUT
C               IMMEDIATELY
C
C
  22     WRITE(LU,100)
 100     FORMAT(/"/SPOLX: ENTER 5 DATA VALUES: _")
         READ(LU,*)(DATA(I),I=1,5)
         IF(DATA.EQ.0.)GO TO 50
         IF(DATA.NE.-1.)GO TO 24
         CALL EXEC(23,ISMP,8,LUSPOL)
         CALL RMPAR(IRTNBF)
         ITRK=IRTNBF
         ISEC=IRTNBF(2)
         IXTNT=IRTNBF(3)
         GO TO 26
  24     IF(DATA.NE.-2.)GO TO 25
         CALL EXEC(23,ISMP,9,LUSPOL,ITRK,ISEC,IXTNT)
         GO TO 26
  25     IF(DATA.NE.-3.)GO TO 26
         CALL EXEC(23,ISMP,5,LUSPOL,6,10)
```

```
        CALL EXEC(23,ISMP,3,LUSPOL)
        GO TO 26
  26    WRITE(LUSPOL,200)ICNT,DATA
 200    FORMAT("  ITEMS"I3" :",5(G10.3))
        GO TO 22
C
C     CLEAN-UP
C
C     ISSUE TOP-OF-FORM ON OUTPUT
C
  50    CALL EXEC(3,ICNWD,-1)
C
C     CLOSE THE SPOOL AND PASS IT TO SMP
C
        CALL EXEC(23,ISMP,4,LUSPOL)
C
C     TERMINATE
C
 999    WRITE(LU,199)
 199    FORMAT("/SPOLX: DONE!"/)
        END
        END$
```

Chapter 4
Spool Control with Gasp Operator Commands

Introduction

Once a job has been entered in the spool system, its processing is automatic. As described in Chapter 2, priority for execution and output can be specified in the :JO command, spooling priorities and device information in the :SL command. Given these values, spooling proceeds automatically unless you choose to change the sequence of operations with the GASP commands described in this section, or an error occurs on an active outspool device.

Each time GASP is run, it checks whether the job queue file JOBFIL exists. If it exists, GASP knows that it has previously initialized the spooling system and the user may enter the commands explained in this section. If JOBFIL does not exist, GASP enters the initialization process to set up the spooling system (see Chapter 5 on GASP initialization).

In a session system, the spool system can only be initialized by the system manager.

The interactive program GASP provides a set of commands that allow you to:

* change the job priority or abort a job that is not yet processed
* hold a spool file from processing or release it from hold
* hold (delay) job output from being outspooled to a device or release it from hold
* display the status, priority, job number, user ID, and name of all jobs
* display the status, priority, job number, user ID, and output logical unit of all outspool files
* restart an outspool or direct an outspool to another device
* "kill" or close and end the spool file-spool LU association
* shut down and start up the spool system without altering jobs or outspools
* remove the spool capability of the system by purging all spool files.
* purge a spool file

INDEX TO GASP OPERATOR COMMANDS

Schedule GASP: :RU,GASP< ,command / or / ,lu >	
Command Syntax	**Function**
AB,job # [,u.g]	Abort pending job.
CJ,job #< ,priority / ,H / ,R >	Change job status or priority.
CS,spoolfile< ,priority / ,H / ,R >	Change outspool status or priority.
DA KILL SPOOLING?YES/NO	Deallocate spool system; respond YES to execute DA, anything else to terminate DA.
DS[AL][,lu[,u.g]]	Display all current outspools or all spools to a particular device, and spool status.
DJ[AL]< ,job # / ,jobname [,u.g]>	Display all current jobs or particular job, and job status.
EX	Terminate GASP.
KS< [,spoolfile[,u.g.]] / or / ,lu >	Kill spool file or file currently outspooling to a device.
RS,spoolfile[,lu]	Restart outspool from beginning; optionally, to a new device.
SD ,B| / ,S|	Shut down batch processing (pending jobs) or outspooling (pending spools) or both.
SU ,B| / ,S|	Start up batch processing (pending jobs) or outspooling (pending spools) or both.
UP[,RS]	Remove all downed outspool devices, that have active outspool files in the queue, from I/O suspension state. Continue outspooling the file or optionally restarting the outspool file from the beginning.
??[,error#[,lu]]	Request explanation of error code.

Gasp Commands

A summary of the commands that perform these functions is listed in Table 4-1.

Table 4-1. GASP Operator Command Summary

CATEGORY	COMMAND	FUNCTION
GASP Operation	:RU,GASP	schedule GASP
	:RU,GASP, command	run GASP, execute command, then terminate
	??	request error explanation
	EX	terminate GASP
Job Manipulation	DJ	display job status
	CJ	change job status or priority
	AB	abort a job before it runs
Spool File Manipulation	DS	display spool status
	CS	change spool status
	RS	restart an outspool
	KS	kill a spool
	UP	up the downed outspool devices and continue outspooling
Spool System Manipulation	SD	shut down spool system
	SU	start up spool system after shut down
	DA	purge spool system files after shut down

Running Program Gasp

The program GASP can be run in one of two modes.

Format

:RU,GASP[,lu]	Schedules GASP to prompt for command from lu. A session user's terminal is the default.
:RU,GASP,command	Schedules GASP, executes command, then terminates.
Parameters	
lu	Logical unit of interactive device on which GASP commands are entered. In a session environment lu must be specified if it is different from the session logical unit.
command	Any GASP operator command (see Table 4-1).

When GASP is scheduled, it responds with a prompt. On some devices, this is an up-arrow; on others such as the HP 2645 terminal, it is a caret (^). Any of the commands shown in Table 4-1 may then be entered.

Examples

1. Run GASP in a session:

```
:RU,GASP <------------ input expected from session's logical unit
^ <------------------- GASP prompt
```

2. Run GASP and direct input to LU7

```
:RU,GASP,7 <---------- input expected from invoking session's
                       logical unit 7
```

3. Run GASP, execute DJ command, then terminate GASP

```
:RU,GASP,DJ <--------- output of DJ command sent to session
                       terminal
```

Gasp Error Explanation

When an error occurs during GASP operation, an error code is printed in the form of a positive or negative integer. Negative integers indicate FMP errors caused by calls to File Management System utility programs; positive error codes indicate GASP program errors. The error codes are printed at the terminal. Appendix B contains a list of Batch and Spool System FMGR and GASP error codes with their meaning. You can also request GASP to display the meaning of a particular error or all errors with the ?? command. This explanation is normally displayed at your terminal, but you can ask that it be displayed on another output device.

Format

```
^??[,error#[,lu]]

Parameters

error #   Positive or negative integer specifying a particular
          GASP error code; if omitted, an explanation of the
          most recent error is displayed; if error # is 99,
          an explanation of all error codes is displayed.

lu        Logical unit on which error code description is
          displayed; use only if error # is 99 for a listing
          of all errors; if omitted, display is at terminal.
```

Examples

1. Request meaning of latest error code:

```
^AB,AA <-------------------- AB requires a job number, not a name
GASP  3
^??
GASP 3 BAD JOB NUMBER!
```

2. `^??,99,6 <------- request list of all error code meanings on line printer`

EX — Terminate Gasp

When you are through using GASP, you may return to the system from which GASP was scheduled with the EX command.

Format

```
+---------------------------------+
|                                 |
|  ^EX                            |
|                                 |
+---------------------------------+
```

GASP prints:

    END GASP

and then terminates.

Job Manipulation

Jobs that have been entered in the directory file JOBFIL by program JOB can be manipulated with the GASP commands:

DJ	display job status
CJ	change job status
AB	abort pending job

JOBFIL is the inspool directory that maintains the queue of inspooled jobs with information on each one. These jobs may be in one of the following states:

I	in process of being inspooled by JOB
IH	in process of being inspooled by JOB and to change to state RH when inspooled
IA	in process of being inspooled by JOB and is to be aborted
R	ready to be processed
RH	ready to be processed but being held
A	active, that is, being run
CS	completed and ready for outspooling

DJ — Display Job Status

The DJ command displays the job number, job name, job status and priority, user.group, and the spool pool files assigned to the job except the job input spool. You may request that all jobs (session and non-session) currently in the spool system or any particular job be displayed.

Format

```
+-------------------------------------------------------------------+
|        ,job #                                                     |
| DJ[AL]<          [u.g]>                                           |
|        ,jobname                                                   |
|                                                                   |
| Parameters                                                        |
|                                                                   |
| AL       Causes all jobs (session and non-session) to be reported |
|                                                                   |
| job#     Job number of particular job to be displayed.            |
|                                                                   |
| jobname  Name of the job or jobs to be displayed                  |
|                                                                   |
|          If both job# and jobname are omitted, all jobs currently |
|          in the system for the current user are displayed.        |
|                                                                   |
| u.g      Reports only jobs belonging to the user.group account of |
|          u.g.  If the `@' character is used for either the user   |
|          or group, then all session users or groups (or both) are |
|          reported.                                                |
|                                                                   |
+-------------------------------------------------------------------+
```

The display if formatted as:

```
   JO#     NAME     STATUS     USER.GROUP     SPOOLS
```

The first field (JO#) of the display is the job number. Jobs are numbered consecutively from 1 according to the record they occupy in JOBFIL.

Under NAME is the job name assigned in the :JO command or in the :XE command to program JOB. If a job is entered directly from a device specified in the :XE command, then this name is blank until FMGR processes the job. Refer to the XE command description, Chapter 2.

The field STATUS lists the job source and priority as well as its status in the form:

```
     x ppppss
```

where x is either S or D. S means the job is on a disc file, D that it is on a non-disc device; pppp is the job priority; ss is the current job status, I, IH, IA, R, RH, A, or CS, (see previous paragraph).

Under the heading SPOOLS are the integers identifying any spool pool files associated with the job except the job input spool. For example, if the job uses spool files SPOL01 and SPOL10, then 1 and 10 are listed under SPOOLS. When a job uses more than one spool, the spools are listed in ascending numeric order.

The field USER.GROUP lists the user.group name specified in the :JO statement. If the user ID parameter was left blank, the ID of the session invoking the batch job is used. This field only appears when the DJAL or u.g parameters are specified.

Examples

1. Display all jobs running under session;

```
^DJ,,@.@

JO#      NAME      STATUS      USER.GROUP      SPOOLS

 1       BAT1        5          JIM.MKT          1
 2       RUNIT       5          SUE.BAS          2
```

2. Display all jobs in system:

```
^DJAL

JO#      NAME      STATUS      USER.GROUP      SPOOLS

 1       BAT1        5          JIM.MKT          1
 2       RUNIT       5          SUE.BAS          2
 3       BTSYS       5                           5
```

3. Display all jobs with the USER.GROUP name JIM.MKT:

```
^DJ,,JIM.MKT

JO#      NAME      STATUS      USER.GROUP      SPOOLS

 1       BAT1        5          JIM.MKT          1
```

4. Display all jobs with the GROUP name of BAS:

```
^DJ,,@.BAS

JO#      NAME      STATUS      USER.GROUP      SPOOLS

 2       RUNIT       5          SUE.BAS          2
```

CJ — Change Job Status

Job status or priority can be changed with the CJ command. This command may only be used for a job in I, R, or RH status; it may not be used if the job is active or has completed processing.

Format

```
^CJ,job #  ,priority
           ,H
           ,R
```

Parameters	
job #	Number assigned to job by spool system; use DJ to display job numbers.
priority	New job priority; only allowed before job is active.
H	Hold job from processing; changes R status to RH, and I to IH
R	Release job for processing; changes RH status to R

The system manager defines at GASP initialization the capability level needed for a user to execute this command on a job with an account name different from the user's USER.GROUP name.

Examples

1. ^CJ,4,H <---------- hold job 4; sets status to RH
2. ^CJ,4,R <---------- release job previously held
3. ^CJ,3,30 <---------- assign new priority to job 3

AB — Abort Job

Before a job is processed, it may be removed with the AB command; AB deletes the job entry from the file JOBFIL. The system manager defines at GASP initialization the capability level needed for a user to execute this command on a job with an account name different from the user's USER.GROUP name.

In order to abort a currently active job, use the RTE AB command (refer to the RTE-IVB Terminal User's Reference Manual).

Format

^AB,job # ,[u.g]
Parameter
job # Number assigned to job by spool system; use DJ to display job numbers.
u.g Aborts all jobs owned by session account u.g.

This command may be used only for jobs in I (input), R (ready) or IH (input hold) or RH (ready and hold) status. The command sets the job status to A (active) or IA (input active) so that FMGR removes it from the job queue, as if it had been processed, the next time it scans the queue. FMGR scans the queue when it finishes processing the current job. If FMGR is dormant, GASP schedules it and FMGR scans the queue as soon as it starts executing.

Example

```
^AB,4          removes job 4 before it is processed
```

In the case of state IA (input active), the job input is completed and the state goes to A (active), at which point FMGR can remove the job as above. A job in I or IH states may also be removed by aborting JOB. The JOBFIL entry may then be cleaned up by executing a GASP SU command or by running JOB again.

Spool File Manipulation

Spool files maintained in the directory file SPLCON can be displayed or their status changed with the GASP commands:

DS	display spool status
CS	change spool status
RS	restart outspool from beginning
KS	purge spool file
UP	Up the downed outspool devices and continue outspooling

A Spool file is normally in one of two states: either waiting for a device or actively being written to the device. In either of these two states, a spool file can be held and then subsequently released. The possible spool file states are:

W	waiting for a device, or put into wait state by :CS or :SL command
A	being written to the device
H	held by operator; spool file was in wait status
AH	held by operator or spool system if the outspool device went down; spool file was in active status

When an active spool file is held, the device to which it is outspooling is locked from further use until the outspool is released, killed, or respooled. This maintains the integrity of the output to that device.

DS — Display Spools

The DS command displays the spool file name, job number, user.group name, outspool priority, the spool status, and the logical unit to which the file is being or will be outspooled. You may request either all current spool files, all spool files assigned to a particular session user or group or all outspools currently assigned to a particular logical unit.

Format

^DS[AL][,lu[,u.g]]

Parameters

AL	Causes all spools (session and non-session) to be reported.
lu	Outspool logical unit; only files directed to this lu are displayed; if omitted, all files in the outspool queue are displayed. If in session, lu is the session LU, and the LU displayed is the system LU that the session LU maps to.
u.g	Reports only files belonging to the account of u.g. If the 'e' character is used for either the user or group, then all users or groups (or both) are reported.

The display heading is:

```
SESLU    SYSLU    NAME     PRIORITY   JOB#    STATUS    USER.GROUP
```

Listed below this heading is one entry for each file being spooled, that is, for each file listed in SPLCON.

The first field, under SESLU, contains the session outspool logical unit number, from the user's SST that may be mapped to the system outspool LU. If the system outspool LU is not included in the user's SST then two dashes (--) are printed for the session LU.

The field under SYSLU contains the system outspool logical unit number. If the spool was created outside of session, the first two fields will be the same.

Under NAME are the names of the files currently assigned for spooling.

The next field, priority, contains the outspool priority; this is the same as the job priority unless a different outspool priority was specified in the :JO, :SL, or :CS commands (see Chapter 2).

Under JOB# is the number of the job that generated the spool file if the spool file was set up from a job.

Under STATUS, one of the possible outspool states is listed as: A, W, AH, or H (See Spool File Manipulation); or, if the file is not to be outspooled the status is "--".

The USER.GROUP field specifies the spool owner's user.group name for session users.

If there are no spools currently being outspooled or read or written to the message NO SPOOLS is printed below the heading. If spooling has been shut down, the message SHUT DOWN is printed.

If the spool file has not been assigned to a device for outspooling, then two dashes (- -) are printed under the headings SESLU, SYSLY, and STATUS. This means the spool file has been connected to a job but is not used for outspooling; that is, it was used for input only or is not to be outspooled.

Examples

1. Display all current session related spool files:

```
^DS,,@.@

SESLU    SYSLU    NAME     PRIORITY    JOB#    STATUS    USER.GROUP
  6        6      SPOL01      010        1       A        BILL.MKT
  6        6      SPOL02      020        2       W         JIM.MKT
  10       6      SPOL03      040        3       W        MARK.LAB
  6        6      SPOL04      050        4       W          ED.LAB
  --       --     SPOL05      010        1       --         ED.LAB
```

All spool files except SPOL01 and SPOL05 are in wait state; SPOL01 is active, and SPOL05 is not going to be outspooled.

2. Display all spool files in current user's session currently assigned to session LU 10:

```
^DS,10

SESLU    SYSLU     NAME      PRIORITY    JOB#    STATUS
  10       6      SPOL03        040        3       W
```

3. Display all spool files owned by account JIM.MKT:

```
^DS,,JIM.MKT

SESLU    SYSLU     NAME   PRIORITY    JOB#    STATUS    USER.GROUP
  6        6      SPOL02     020        2       W         JIM.MKT
```

4. Display all spool files owned by an account with a group name of MKT:

```
^DS,,@.MKT

SESLU    SYSLU     NAME   PRIORITY    JOB#    STATUS    USER.GROUP
  6        6      SPOL01     010        1       A         BILL.MKT
  6        6      SPOL02     020        2       W         JIM.MKT
```

CS — Change Spool Status

The status of an outspool file can be changed with the CS command. CS command will also change spool priority, but only if the outspool file is not active.

Format

```
                ,priority
^CS,spoolfile<,H       > [,u.g]
                ,R
```

Parameters

spoolfile	Name of spool file as displayed by DJ.
priority	New outspool priority.
H	Hold spool file; if active, change status to AH; if waiting, change status to H.
R	Release spool file that has been held in AH or H status.
u.g	Change status of spool file belonging to session account u.g.

The system manager defines at GASP initialization the capability level needed for a user to execute this command on a spool file set up with an account name different from the user's USER.GROUP NAME.

When a hold is placed on an active file, the device to which it is outspooling is locked and the device is unavailable until the hold is released with the R parameter of CS, or the file is killed with the KS command or respooled with RS. When a hold is released on a spool file in AH status, the outspooling is continued from where it was when held.

If an outspool LU is found to be down by SPOUT, it will notify SMP, which will then hold the file (change state from A to AH). A message will also be sent to the system console.

The priority of an active spool file may be changed; the entry in SPLCON reflects the new priority but the outspooling continues unaffected by the new priority unless the file is respooled. If priority is changed on a file in Wait or Hold status, the new priority will affect when it is outspooled.

For the effects of CS on outspools in various states, refer to Figure 4-1.

If more than one spool file is defined by the same file name and under different session accounts, u.g must be specified. If more than one spool file is defined by the same file name under the same account, the status is changed for the first file encountered.

Examples

1. Place hold on active spool, SPOL01:

```
^CS,SPOL01,H <--------------- place hold on SPOL01
^DS

SESLU   SYSLU    NAME    PRIORITY    JOB#   STATUS
  6       6     SPOL01      010        1      AH    <---SPOL01 was
  6       6     SPOL02      020        2       W        actively
 10       6     SPOL03      040        3       W        outspooling
  6       6     SPOL04      050        4       W

^CS,SPOL01,R <---SPOL01 will continue outspooling from point where
                 it was held
```

2. Change priority of inactive spool file, SPOL04:

```
^CS,SPOLO4,25

^DS

SESLU   SYSLU    NAME    PRIORITY    JOB#   STATUS
  6       6     SPOL01      010        1       A
  6       6     SPOL02      020        2       W
 10       6     SPOL03      040        3       W
  6       6     SPOL04      025        4       W
                             ^
                             |
                             + ------------ new priority displayed
```

RS — Restart Spool

An active outspool file can be restarted from the beginning with the command RS.

Format

```
^RS,spoolfile[,lu] [,u.g]

Parameters

spoolfile   Name of active or active-held spool file in outspool
            queue.

lu          New logical unit to which file is to be outspooled; if
            omitted, logical unit previously assigned is used for
            spool output.

u.g         Restart spool file belonging to session account u.g.
```

The system manager defines at GASP initialization the capability level needed for a user to execute this command on a spool file set up with an account different from the user's USER.GROUP name.

When an active or active-held spool file is restarted, it is restarted from the beginning of the file. The restart automatically removes the hold from an active-held file. If the file is to be outspooled to a device with a waiting queue, it may go back into the wait state on the new outspool queue, and be re-queued at the end of its priority queue on the device queue.

A file in wait state is not affected by the RS command (except that they move to the end of the priority list on the given outspool queue) unless lu is specified to change the outspool logical unit, and thereby move the spool to another queue. Files that have completed outspooling are no longer in the SPLCON queue and, thus, may not be restarted.

For the effects of RS on outspools in various states, see Figure 4-1, Changing Outspool File Status.

If more than one spool file is defined by the same file name and under different session accounts, u.g must be specified. If more than one spool file is defined by the same file name under the same account, the RS command uses the first file encountered.

Examples

1. Restart active spool file, SPOL03:

   ^RS,SPOL03

2. Change the session outspool logical unit from the unit 6 to 4:

   ^RS,SPOL04,4

   In this case, the file can be either active or waiting.

Spool File State Diagram

Under normal spool control, without using GASP, an outspool file in the Wait state (state W) is selected by SMP for outspooling when it reaches the top of the outspool queue in file SPLCON. This procedure can be altered with either CS or RS as illustrated in Figure 4-1.

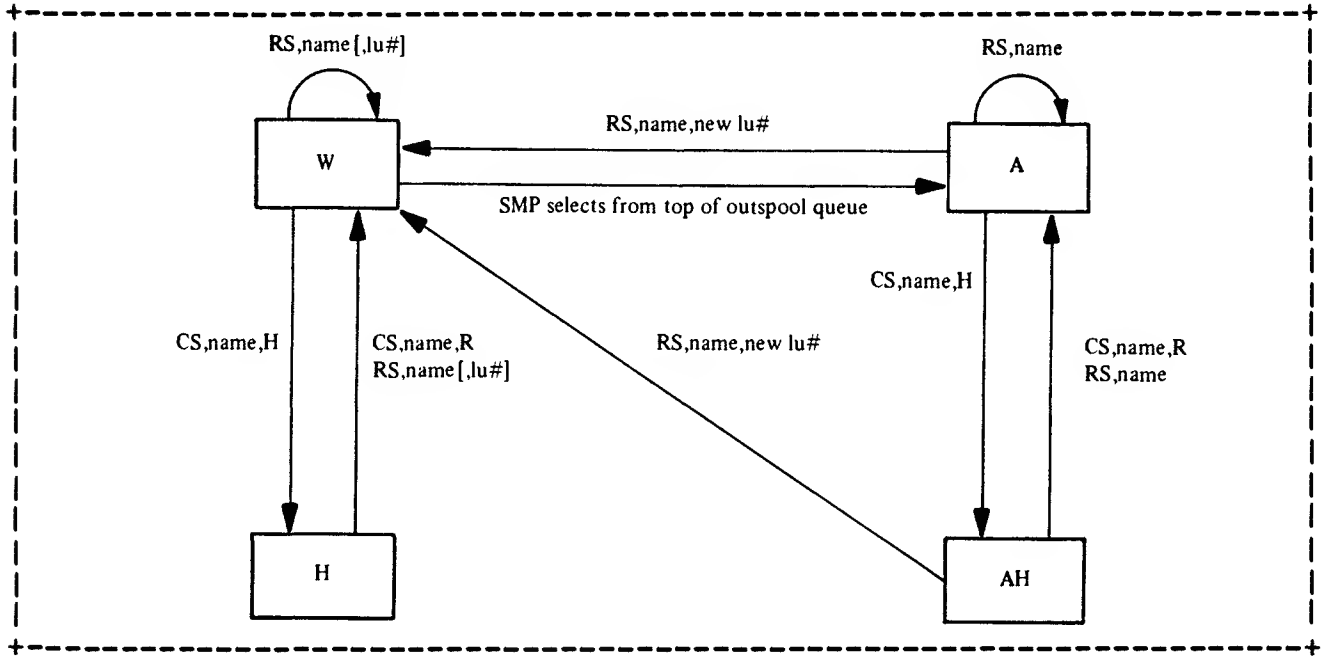


Figure 4-1. Outspool File State Diagram

To summarize, the possible changes:

* From wait state (W), a file can be:
  moved to active state (A) by SMP as next outspool
  moved to hold state (H) with CS command
  purged from the spool queues with the CS command.

* From hold state (H), a file can only be:
  moved to wait state (W) with CS or RS commands
  purged from the spool queues with the CS command.

* From active state (A) a file may be:
  returned to wait state (W) with RS command
  moved to active-hold state (AH) with CS command
  purged from the spool queues with the CS command.

* From active-hold state (AH) a file may be:
  moved to wait state (W) with RS command
  moved to active state (A) with CS or RS commands
  purged from the spool queues with the CS command.

KS — Kill Outspool

An outspool file can be removed from the outspool queue (killed) with the KS command.

Format

```
      ,spoolfile
  ^KS<    or    > [,u.g]
      ,lu
```

Parameters

spoolfile	Name of spool file to be removed.
lu	Logical unit of device to which file is being outspooled. When running under session, lu is the session logical unit number.
u.g.	If spool file is specified, then kills file belonging to session account u.g. If spool file is not specified, then kills all spool files belonging to session account u.g.

The system manager defines at GASP initialization the capability level needed for a user to execute this command on a spool file set up with an account name different from the user's USER.GROUP name.

When a spool file actively being outspooled is killed, the output is terminated. If any other file is in the queue to be outspooled to that device, the file at the top of the outspool queue in SPLCON is started.

You may kill an outspool whose job or program is still active. However, this may cause job or program abortion. In this case GASP will verify the kill command before proceeding.

When a session user's spool file is killed, the user's Session Switch Table (SST) entry containing the session LU-spool LU mapping is modified so the session LU will point to system LU 255. Any further I/O requests to that LU will result in an IO26 error. To recover, enter one of the following:

```
:SL,lu,-
:CS,lu
:SL,lu,...  (set up new spool file-spool lu association)
```

If more than one spool file is defined by the same file name and under different session accounts, u.g must be specified. If more than one spool file is defined by the same file name under the same account, the KS command uses the first file encountered.

Example

```
^DS

SESLU    SYSLU     NAME      PRIORITY   JOB#    STATUS

 10        6       CO2801       09        18       A

^KS,CO2801
MAY ABORT PROGRAM OR JOB, OK TO KILL CO2801? YES<----Yes, i.e.,
                                                   Kill verified
^EX
END GASP

I026 ASMB  51725 <-----ASMB was listing to CO2801 so it aborts on
ASMB ABORTED           next write attempt.
```

Caution should be used when lu is specified. This will purge the file currently being outspooled to that logical unit. If there are other files queued for outspooling to that device, it is possible that the file you intended to purge has completed outspooling, in which case, you will inadvertently purge the next file in the queue since it has become the currently active file to the specified device.

Example

1. If no other jobs are being outspooled to system logical unit 10, the spool file can be killed with:

```
^DS,15

SESLU    SYSLU      NAME      PRIORITY    JOB#    STATUS
 15        10       SPOL04       050        4        A

^KS,15 <---------- kill file outspooling to system logical unit 10
MAY ABORT PROGRAM OR JOB, OK TO KILL SPOL04? YES
```

UP — Up Outspool Device

All downed outspool devices with active outspool files in the queue are removed from the I/O suspension state. The active-held outspool files are released or if the RS option was chosen, they are placed in the outspool queue to be started from the beginning.

^UP[,RS]	
Parameter	
RS	Restart the active outspool files on the downed outspool devices from the beginning.

The GASP program searches all the outspool queues. If an outspool lu is down and there is an active or active-held outspool file in its queue, the following action is taken:

a. the system UP, eqt command is performed where eqt is the EQT entry number of a downed outspool device.

b. the GASP CS, spoolfile, R command is performed to release the outspool file. If the RS option was specified, then the GASP, RS spool file command is performed to restart the outspool file.

EXAMPLES:

1. LU 6 and LU 8 are down. UP these devices and release the active outspools.

```
:RU,GASP
^DSAL
  SESLU SYSLU NAME  PRIORITY JOB# STATUS USER.GROUP

     6     6  SPOL01    99     --   AH   ED.LAB
     6     6  SPOL02    99     --   W    BILL.MKT
     8     8  SPOL03    99     --   AH   JIM.MKT
^UP
^DSAL
  SESLU SYSLU NAME  PRIORITY JOB# STATUS USER.GROUP

     6     6  SPOL01    99     --   A    ED.LAB
     6     6  SPOL02    99     --   W    BILL.MKT
     8     8  SPOL03    99     --   A    JIM.MKT
^EX
END GASP
```

Spool files SPOL01 and SPOL03 are released to the outspool devices.

2. LU 6 and LU 8 are down. UP these devices and restart outspooling the active spool files from the beginning.

```
:RU,GASP
^DSAL
  SESLU SYSLU NAME  PRIORITY JOB# STATUS USER.GROUP

     6     6  SPOL01    99     --   AH    ED.LAB
     6     6  SPOL02    99     --   W     BILL.MKT
     8     8  SPOL03    99     --   AH    JIM.MKT
^UP,RS
^DSAL

  SESLU SYSLU NAME  PRIORITY JOB# STATUS USER.GROUP

     6     6  SPOL01    99     --   W     ED.LAB
     6     6  SPOL02    99     --   A     BILL.MKT
     8     8  SPOL03    99     --   A     JIM.MKT
^EX
END GASP
```

Spool files SPOL01 and SPOL03 are returned to the outspool queue so that their outspooling can be restarted.

Spool System Manipulation

The spool system can be shut down at any time during the job processing or spooling phase with the SD command. This suspends batch processing or outspool operations or both, and aborts all inspool operations. While the spool system is shut down, all spool files are closed and their cartridges can be packed. The spool system can be restarted with the GASP startup command (SU) or removed from the system with the GASP deallocate spooling command (DA). (See the description of this command below.) If removed, all spool pool and control files are purged, GASP is terminated, and the spool system is no longer active. Before further spooling can be performed, the spool system must be reinitialized.

The commands to perform these functions are:

SD shut down

SU restart after shut down

DA deallocate the spool system

SD — Shut Down Spooling

You may hold all spooled jobs, all spooled output, or both with the SD command.

Format

```
+-----------------------------------------------------------------+
|      ,B[ATCH]                                                   |
|     /   ---- \                                                  |
| ^SD<   or     >                                                 |
|     \,S[POOL]/                                                  |
|         ----                                                    |
|                                                                 |
| Parameters                                                      |
|                                                                 |
| B    Hold all pending jobs: spool files are not affected.       |
|                                                                 |
| S    Hold all pending spool files; job processing is not affected.|
|                                                                 |
| none If both B and S are omitted, then both job processing and |
|      outspooling are held. Inspooling by JOB may continue.      |
|                                                                 |
+-----------------------------------------------------------------+
```

The system manager defines at GASP initialization the capability level needed for a user to execute this command.

All WR or BO spool files to which data is being written must be killed before shutdown can proceed. GASP asks for verification to kill each inspool file by displaying this message:

```
MAY ABORT PROGRAM OR JOB, OK TO KILL filename?
```

If "NO" is specified, shutdown is not performed, and this message is displayed:

```
SHUTDOWN NOT PERFORMED
```

While shutdown is in progress, SMP allows a WR or BO spool file to be set up.

Any jobs or spools that are currently outspooling (but not inspooling concurrently) when SD is specified are allowed to run to completion.

Examples

1. ^SD,B <--- no further batch job processing until system is restarted.

2. ^SD,S <--- no further outspooling or inspooling until system is restarted.

3. ^SD <----- no further job processing, inspooling, or outspooling, until system is restarted.

SU — Start Up Spooling

To start up the spool system after it has been shut down with SD, use the SU command. Also, use SU to start batch and/or spool if SMP or FMGR has been aborted by the operator, or after restarting the operating system, to process any jobs or files remaining in the queues from previous runs.

Format

```
+-------------------------------------------------------------------+
|       ,B[ATCH]                                                    |
|      /   ---- \                                                   |
| ^SU<     or    >                                                  |
|      \,S[POOL]/                                                   |
|          ----                                                     |
|                                                                   |
| Parameters                                                        |
|                                                                   |
| B    Jobs held with SD are released; does not restart outspooling.|
|                                                                   |
| S    Outspools held with SD are released; does not restart job    |
|      processing.                                                  |
|                                                                   |
| none Both jobs and outspools held by SD are restarted.            |
+-------------------------------------------------------------------+
```

The system manager defines at GASP initialization the capability level needed for a user to execute this command if the system is shut down.

A job or spool file that was held with a command other than SD will not be restarted. For instance, SU will not restart spooling on a particular outspool file held with CS or a job held with CJ.

Execution of the SU command might cause some error recovery actions, and thus may remove blocks caused by untimely aborts of programs. For this reason the SU command can be executed by any user, provided the system is not shut down.

Examples

1. ^SU,B <----- restart jobs held with SD or SD,B

2. ^SU,S <----- restart outspooling held by SD or SD,S

3. ^SU <----- restart job processing and/or outspooling held by SD

4. If you want to run a job now, but spool output at a later time, you can use the SD and SU commands:

```
:RU,GASP
^SD,S                    shut down outspooling
^EX
```

Jobs can now be inspooled and processed; there will be no outspooling until

```
:RU,GASP
^SU,S                    start up outspooling
^EX
```

DA — Deallocate Spooling

The spool system can be deallocated with the DA command. Before using DA, the spool system must be shut down, all files must be closed, and all current job processing and/or outspooling should be completed.

For systems with session monitor installed, only the system manager can execute this command.

CAUTION

Be certain that all discs containing spool system files are mounted before using the DA command.

Format

^DA	
Response:	
KILL SPOOLING?	The system prints this message in response to DA in order to give you a chance to change your mind; answer YES if you want to remove the spool system; any other response is treated as NO and the next GASP prompt is issued.

NOTE

Do not use ^DA if GASP was scheduled from program FMGR rather than from a session, since it is possible that JOBFIL is still open.

If any file is currently active because a job is being processed or a file is being outspooled, the deallocation cannot be performed. GASP reports the file name of the open file followed by the message: FILE OPEN OR LOCK REJECTED. It then terminates the DA command and issues the next GASP prompt. You may either purge the file with KS or you may wait for completion and then re-enter DA. As a general rule, you should wait for completion or abort any active job or outspool before entering DA. This allows active jobs and spools to complete and close all files.

If DA is sucessful, GASP issues the following message and then terminates:

```
SPOOL IS DEAD
END GASP
```

Following this message, you must re-initialize the spool system before it can be used again. If you run GASP, it will automatically issue the first prompt of the initialization process rather than the standard GASP interactive prompt (^). Refer to Chapter 5 for a description of how to initialize the spool system with GASP.

Examples

1.
```
^SD
^DA
KILL SPOOLING?NO <------ any response except YES terminates DA
^SU
```

2.
```
^SD
^DA
KILL SPOOLING?YES
SPOLO4 <-------------- SPOLO4 is open
GASP -8 FILE OPEN OR LOCK REJECTED

^KS,SPOLO4 <------- purge SPOL04
^SD <-------------- shut down system and then deallocate spooling
^DA
KILL SPOOLING?YES

SPOOL IS DEAD
END GASP
```

Chapter 5
Batch and Spooling Initialization

After a system is generated, the Batch and Spooling system must be initialized by the System Manager. Initialization must also occur if the spool system was deallocated with the GASP DA command (see Chapter 4).

Initialization of the spool system is accomplished by the System Manager running the program GASP. Each time GASP is run, the program checks to see if the file JOBFIL exists. If JOBFIL does exist, GASP assumes the spool system is initialized, and the standard GASP prompt is issued. If JOBFIL does not exist, GASP will issue a series of prompts to initialize the spool system. If any user other than the system manager attempts to initialize the spool system, an error message is sent to the user's console and GASP terminates.

Gasp Initialization

The following sub-sections describe each prompt issued during GASP's initialization of the spool system. The initialization process sets up the spool directory files JOBFIL and SPLCON, and the spool pool files (see Appendix C for the format of the files JOBFIL and SPLCON).

"Capability Level for Privileged Gasp Commands?"

The answer to this question determines what capability level a session user needs in order to use the CJ, AB, KS, CS, and RS GASP commands against other user's jobs and spool files. A session user also needs this capability level if executing a GASP SD command, or if shut down, the GASP SU command. These commands may be executed from the system console.

"Max Number of Jobs, Job File Disc?"

The first part of this prompt defines the maximum number of active and pending jobs. The largest possible response is 254. GASP uses this number to determine the size needed for the file JOBFIL, which keeps track of all batch jobs in the system. Each job entry requires a 16-word record in JOBFIL.

The second part of the question, "JOB FILE DISC", asks you to enter the cartridge reference number of the cartridge used for JOBFIL and SPLCON files. You should choose a cartridge that:

* is always in the system (a fixed platter)

* you will not want to pack unless you can shut down spooling while you pack

* is reserved for exclusive use of the spooling system (if possible)

* is a session cartridge mounted to MANAGER.SYS (for session systems)

"Number of Spool Files (5 to 80)?"

The response to this question defines the number of spool pool files to be created. Enter a response from 5 to 80. Each spool pool file's name will start with SPOL, followed by the number of the file. It should be noted that every job inspooled from a non-disc device requires a spool pool file.

"Size of Spool Files (in Blocks)?"

The answer to this question defines the size, in blocks (1 block=256 bytes), of the spool pool files created in response to the previous question.

The following should be noted before determining the response to this prompt:

* Any job inspooled from a non-disc device will be stored in a spool pool file. If most jobs contain a small number of commands, a large spool pool file would be wasteful.

* Whenever the size of the spool pool file is too small, file extents are created automatically, as needed. The overhead introduced by file extents has the disadvantage of slowing down file access speed, as well as filling up cartridge directory space.

* If one cartridge is allocated solely for spool pool files, the following formula can be used to balance the number of directory entries and the amount of disc space available:

$$S = \frac{T * B}{E + P}$$

where:

S = size of spool pool files in blocks.
T = # of disc tracks in cartridge.
B = # of blocks per track.
P = # of spool pool files.
E = # of extents that can be accommodated in the directory.
P+E = # of cartridge directory entries.

* For most systems. the optimal range is from 24 to 35 blocks.

"Number, Location of Spool Files?"

Enter the number of spool files to be placed on a particular cartridge in the form nn, crn where nn is the number of files and crn is the cartridge reference or negative logical unit number. This prompt is repeated until you enter an E. The total number of spool files allocated to all cartridges should equal the number of spool files specified in response to GASP's third prompt. All cartridges entered in response to this question should be system or non-session cartridges.

If a GASP 2 error is encountered after ending the responses to this question, the question will be repeated with all previous responses to the question being ignored by GASP.

"Maximum Number Active and Pending Spool Files?"

The response to this question determines the maximum number of both spool pool and user files that are active or pending, at one time. This number determines the size of the file SPLCON. Each active or pending spool file requires a 16-word entry in SPLCON. The maximum number of entries allowed is 256.

An entry in SPLCON is opened under the following conditions:

* A file is sent to be outspooled
* A spool pool file is opened for outspooling
* A user file is being processed
* A spool pool file is used for inspooling or processing
* An SL equivalence is made to a file

The response to this question should be the sum of the number of spool pool files and the anticipated number of active or pending user-defined spool files. This number will generally be between 1.5 and 2 times the number of spool pool files. The minimum number accepted is the number of spool pool files minus the number of spool eqt's.

"Enter Outspool Destination LU?"

This question expects a response with two parameters. The first parameter of the response is the system (not session) logical unit number of a device to be used for outspooling. The question will be repeated until an E is entered. All logical units to be used as outspool devices must be entered here.

Each outspool logical unit establishes an 8-record, 16-word per record queue in SPLCON. The maximum number of outspool logical units is 10. The list device, logical unit 6, should always be entered first. Any auxiliary printers, as well as any mag tape units, should also be entered as outspool logical units. System logical unit 1 should not be used as an outspool device.

The second parameter in the response to this question is the Queue depth associated with the outspool LU entered. The spool system has a Queue depth for each outspool logical unit. This is the number of class write requests that the program SPOUT attempts to keep in System Available Memory (SAM) for each logical unit it is outspooling to. This number may be between 1 and 15 inclusive. If this parameter is not specified in a response, or a zero is entered, the default value of 4 is used.

Recommended guide lines are:

punch - 2

low speed line-printer - 3

mag tape - 4

high speed line-printer - 6

EXAMPLE

1. Declare system logical units 6 and 8 as outspool logical units. The Queue depth for LU6 is defaulted to four. For LU8, the Queue depth is declared to be three.

```
ENTER OUTSPOOL DESTINATION LU <------ GASP prompt
6 <------------- declares LU6 as outspool device
ENTER OUTSPOOL DESTINATION LU
8,3 <----------- declares LU8 as outspool device, with a queue
                 depth of six.
ENTER OUTSPOOL DESTINATION LU
E <------------- terminate question
```

Completion of Gasp Initialization

After a successful initialization, GASP terminates with the message:

END GASP

The next time GASP is scheduled, it issues the standard GASP prompt (^).

It sometimes happens during GASP initialization that a duplicate file name is found for either SPLCON or JOBFIL. In this case, GASP issues the message:

DUP FILE NAME filename. DEINITIALIZE?

You may then answer YES so that all spool files will be purged and GASP will then start the initialization over again. Deinitializing may take considerable time if multiple cartridges are currently mounted.

CAUTION

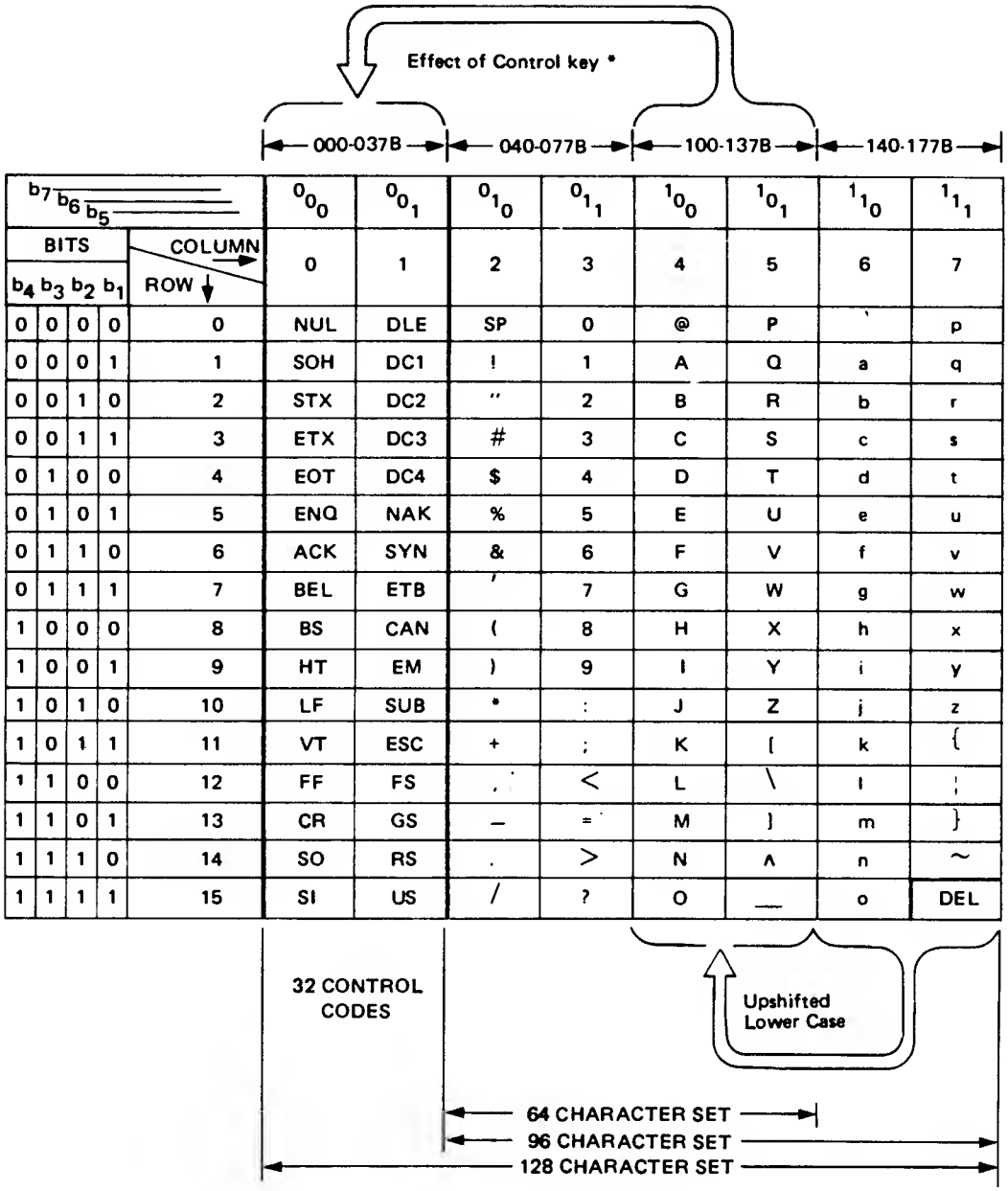
Be certain that all cartridges required by the spool system are mounted before running GASP.

EXAMPLE

1. The following is a typical GASP initialization. A maximum of 20 jobs is expected. Forty spool pool files are declared.

```
:RU,GASP
CAPABILITY LEVEL FOR PRIVILEGED GASP COMMANDS? 50
MAX NUMBER OF JOBS, JOB FILE DISC? 20,SP
NUMBER OF SPOOL FILES (5 TO 80)? 40
SIZE OF SPOOL FILES (IN BLOCKS)? 24
NUMBER, LOCATION OF SPOOL FILES? 40,SP
NUMBER, LOCATION OF SPOOL FILES? E
MAXIMUM NUMBER ACTIVE AND PENDING SPOOL FILES? 60
ENTER OUTSPOOL DESTINATION LU 6,5
ENTER OUTSPOOL DESTINATION LU 8
ENTER OUTSPOOL DESTINATION LU E
END GASP
```

Appendix A
HP Character Set



b_7 b_6 b_5					0_0	0_1	0_1	0_1	1_0	1_0	1_1	1_1
BITS				COLUMN →	0	1	2	3	4	5	6	7
b_4	b_3	b_2	b_1	ROW ↓								
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS	CAN	(	8	H	X	h	x
1	0	0	1	9	HT	EM	)	9	I	Y	i	y
1	0	1	0	10	LF	SUB	*	:	J	Z	j	z
1	0	1	1	11	VT	ESC	+	;	K	[	k	{
1	1	0	0	12	FF	FS	,	<	L	\	l	¦
1	1	0	1	13	CR	GS	–	=	M	]	m	}
1	1	1	0	14	SO	RS	.	>	N	^	n	~
1	1	1	1	15	SI	US	/	?	O	_	o	DEL

EXAMPLE: The representetion for the character "K" (column 4, row 11) is.

	b_7	b_6	b_5	b_4	b_3	b_2	b_1
BINARY	1	0	0	1	0	1	1
OCTAL	1		1			3	

* Depressing the Control key while typing an upper case letter produces the corresponding control code on most terminals. For exemple, Control-H is a backspace.

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HEWLETT-PACKARD CHARACTER SET FOR COMPUTER SYSTEMS

This table shows HP's implementation of ANS X3.4-1968 (USASCII) and ANS X3.32-1973. Some devices may substitute alternate characters from those shown in this chart (for example, Line Drawing Set or Scandanavian font). Consult the manual for your device.

The left and right byte columns show the octal patterns in a 16 bit word when the character occupies bits 8 to 14 (left byte) or 0 to 6 (right byte) and the rest of the bits are zero. To find the pattern of two characters in the same word, add the two values. For example, AB produces the octal pattern 040502. (The parity bits are zero in this chart.)

The octal values 0 through 37 and 177 are control codes. The octal values 40 through 176 are character codes.

Decimal Value	Octal Values		Mnemonic	Graphic[1]	Meaning
	Left Byte	Right Byte			
0	000000	000000	NUL	$^{N}_{U}$	Null
1	000400	000001	SOH	$^{S}_{H}$	Start of Heading
2	001000	000002	STX	$^{S}_{X}$	Start of Text
3	001400	000003	ETX	$^{E}_{X}$	End of Text
4	002000	000004	EOT	$^{E}_{T}$	End of Transmission
5	002400	000005	ENQ	$^{E}_{Q}$	Enquiry
6	003000	000006	ACK	$^{A}_{K}$	Acknowledge
7	003400	000007	BEL		Bell, Attention Signal
8	004000	000010	BS	$^{B}_{S}$	Backspace
9	004400	000011	HT	$^{H}_{T}$	Horizontal Tabulation
10	005000	000012	LF	$^{L}_{F}$	Line Feed
11	005400	000013	VT	$^{V}_{T}$	Vertical Tabulation
12	006000	000014	FF	$^{F}_{F}$	Form Feed
13	006400	000015	CR	$^{C}_{R}$	Carriage Return
14	007000	000016	SO	$^{S}_{O}$	Shift Out } Alternate
15	007400	000017	SI	$^{S}_{I}$	Shift In } Character Set
16	010000	000020	DLE	$^{D}_{L}$	Data Link Escape
17	010400	000021	DC1	D_1	Device Control 1 (X-ON)
18	011000	000022	DC2	D_2	Device Control 2 (TAPE)
19	011400	000023	DC3	D_3	Device Control 3 (X-OFF)
20	012000	000024	DC4	D_4	Device Control 4 ($\overline{\text{TAPE}}$)
21	012400	000025	NAK	$^{N}_{K}$	Negative Acknowledge
22	013000	000026	SYN	$^{S}_{Y}$	Synchronous Idle
23	013400	000027	ETB	$^{E}_{B}$	End of Transmission Block
24	014000	000030	CAN	$^{C}_{N}$	Cancel
25	014400	000031	EM	$^{E}_{M}$	End of Medium
26	015000	000032	SUB	$^{S}_{B}$	Substitute
27	015400	000033	ESC	$^{E}_{C}$	Escape[2]
28	016000	000034	FS	$^{F}_{S}$	File Separator
29	016400	000035	GS	$^{G}_{S}$	Group Separator
30	017000	000036	RS	$^{R}_{S}$	Record Separator
31	017400	000037	US	$^{U}_{S}$	Unit Separator
127	077400	000177	DEL	■	Delete, Rubout[3]

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
32	020000	000040		Space, Blank
33	020400	000041	!	Exclamation Point
34	021000	000042	"	Quotation Mark
35	021400	000043	#	Number Sign, Pound Sign
36	022000	000044	$	Dollar Sign
37	022400	000045	%	Percent
38	023000	000046	&	Ampersand, And Sign
39	023400	000047	'	Apostrophe, Acute Accent
40	024000	000050	(	Left (opening) Parenthesis
41	024400	000051	)	Right (closing) Parenthesis
42	025000	000052	*	Asterisk, Star
43	025400	000053	+	Plus
44	026000	000054	,	Comma, Cedilla
45	026400	000055	-	Hyphen, Minus, Dash
46	027000	000056	.	Period, Decimal Point
47	027400	000057	/	Slash, Slant
48	030000	000060	0	Digits, Numbers
49	030400	000061	1	
50	031000	000062	2	
51	031400	000063	3	
52	032000	000064	4	
53	032400	000065	5	
54	033000	000066	6	
55	033400	000067	7	
56	034000	000070	8	
57	034400	000071	9	
58	035000	000072	:	Colon
59	035400	000073	;	Semicolon
60	036000	000074	<	Less Than
61	036400	000075	=	Equals
62	037000	000076	>	Greater Than
63	037400	000077	?	Question Mark

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
64	040000	000100	@	Commercial At
65	040400	000101	A	
66	041000	000102	B	
67	041400	000103	C	
68	042000	000104	D	
69	042400	000105	E	
70	043000	000106	F	
71	043400	000107	G	
72	044000	000110	H	
73	044400	000111	I	
74	045000	000112	J	
75	045400	000113	K	
76	046000	000114	L	
77	046400	000115	M	
78	047000	000116	N	Upper Case Alphabet, Capital Letters
79	047400	000117	O	
80	050000	000120	P	
81	050400	000121	Q	
82	051000	000122	R	
83	051400	000123	S	
84	052000	000124	T	
85	052400	000125	U	
86	053000	000126	V	
87	053400	000127	W	
88	054000	000130	X	
89	054400	000131	Y	
90	055000	000132	Z	
91	055400	000133	[	Left (opening) Bracket
92	056000	000134	\	Backslash, Reverse Slant
93	056400	000135	]	Right (closing) Bracket
94	057000	000136	^ ↑	Caret, Circumflex, Up Arrow[4]
95	057400	000137	_ ←	Underline, Back Arrow[4]

Decimal Value	Octal Values		Character	Meaning
	Left Byte	Right Byte		
96	060000	000140	`	Grave Accent[5]
97	060400	000141	a	
98	061000	000142	b	
99	061400	000143	c	
100	062000	000144	d	
101	062400	000145	e	
102	063000	000146	f	
103	063400	000147	g	
104	064000	000150	h	
105	064400	000151	i	
106	065000	000152	j	
107	065400	000153	k	
108	066000	000154	l	
109	066400	000155	m	
110	067000	000156	n	Lower Case Letters[5]
111	067400	000157	o	
112	070000	000160	p	
113	070400	000161	q	
114	071000	000162	r	
115	071400	000163	s	
116	072000	000164	t	
117	072400	000165	u	
118	073000	000166	v	
119	073400	000167	w	
120	074000	000170	x	
121	074400	000171	y	
122	075000	000172	z	
123	075400	000173	{	Left (opening) Brace[5]
124	076000	000174	|	Vertical Line[5]
125	076400	000175	}	Right (closing) Brace[5]
126	077000	000176	~	Tilde, Overline[5]

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Notes

[1]This is the standard display representation. The software and hardware in your system determine if the control code is displayed, executed, or ignored. Some devices display all control codes as "|", "@", or space.

[2]Escape is the first character of a special control sequence. For example, ESC followed by "J" clears the display on a 2640 terminal.

[3]Delete may be displayed as "_", "@", or space.

[4]Normally, the caret and underline are displayed. Some devices substitute the up arrow and back arrow.

[5]Some devices upshift lower case letters and symbols (` through ~) to the corresponding upper case character (@ through ^). For example, the left brace would be converted to a left bracket.

RTE SPECIAL CHARACTERS

Mnemonic	Octal Value	Use
SOH (Control A)	1	Backspace (TTY)
EM (Control Y)	31	Backspace (2600)
BS (Control H)	10	Backspace (TTY, 2615, 2640, 2644, 2645)
EOT (Control D)	4	End-of-file (TTY 2615, 2640, 2644, 2645)

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Appendix B
Error Messages
Gasp Error Codes

BATCH-SPOOL ERROR CODES

When using the Batch and Spooling System, numbered error codes and unnumbered error messages may result from improper program calls or command entries. The numbered error codes are either positive or negative. In general negative error codes are a result of improper interface routine (FMP) calls. Positive error codes result from improper commands to the interactive programs FMGR or GASP. However, since these programs often use interface routines to perform the command functions, a negative code can result from a FMGR or GASP command.

The unnumbered error messages result from operator abort requests, job-related conditions, and system commands entered through FMGR.

FMGR ERROR CODES

A FMGR error causes a transfer to the log device whenever operator intervention is needed to correct the error. FMGR remains in control and is not aborted unless a batch job is currently active and the severity code for the job is less than 3. When control transfers to the log device and the terminal at which FMGR was scheduled is not the same as the log device, the terminal is no longer in control and all input must be made from the log device. As many commands as desired may be entered from the log device followed by a TR command without namr. The TR command (refer to the RTE-IVB Terminal User's Manual) returns control to the statement following the erroneous statement.

Since many FMGR commands use FMP interface routines, negative errors can be generated when using the FMGR operator commands.

Interface routine error codes (negative codes) are always returned in the A-Register following a call as well as in the error return location.

A complete list of all FMGR and FMP error codes can be requested from FMGR by entering ??,99. The list is printed on the list device. FMP errors are described in detail in the RTE-IVB Terminal User's Reference Manual. Table B-1 describes the FMGR errors that are related to the Batch and Spooling System.

Table B-1. Batch and Spooling FMGR Errors

ERROR CODE	ERROR MESSAGE	MEANING AND CORRECTIVE ACTION
-52	SPOOL SHUT DOWN. SPOOL FILE SETUP FAILED	Spool shutdown is in progress,a write only or write/read spool file can not be set up at this time. Start up spooling with GASP SU command and then try the spool file setup.
045	SESSION COMMAND ONLY	The specified command operates only in the session environment.
047	SPOOL SETUP FAILED	There are no available spool files or logical units, or the logical unit table is full. You can try running the job again, but if the error is from lack of spool logical units or the logical unit table being full, you must reconfigure.
026	QUEUE FULL OR MAX PENDING SPOOLS EXCEEDED	The spool queue is full or the maximum number of spools pending has been exceeded. The job must be re-run when the space becomes available.
025	NO SPLCON ROOM	The SPLCON is full. This error may occur when the spool system is competing with programs using their own spooling file and running outside of batch.
024	NO MORE BATCH SWITCHES	The LU switch table is full. The size of the switch table specified at system generation is inadequate. Notify the System Manager of this condition.
023	NO AVAILABLE SPOOL FILES	All spool files are currently being used. Re-run the job after a spool file becomes available.
022	NO AVAILABLE SPOOL LU'S	All spool logical units are currently unavailable. Re-run the job after a spool LU becomes available.
021	ILLEGAL DESTINATION LU	The LU specified was not allocated by GASP. Try again using a LU allocated by GASP.

UNNUMBERED ERROR MESSAGES

Unnumbered error messages may result during FMGR execution because of operator abort requests, job related condition, or system commands entered through FMGR. Table B-2 describes these messages, lists possible causes, and suggests corrective action to be taken.

Table B-2. Unnumbered Error Messages

COMMAND	ERROR MESSAGE	MEANING	CORRECTIVE ACTION
:AB or *AB	ABEND OPERATOR	1. The job has been aborted by operator request.	1. Examine job, correct (if necessary), and re-run job.
		2. The job has been aborted because of spool I/O error.	2. Check for such errors as write to read-only spool file, or read to write only spool file.
	JOB xxxxx ABORTED	Error encountered during job execution.	Examine job, correct (if necessary), and re-run job.
:EO or :JO	ABEND EOJ IN ssssss	An :EO or :JO command was encountered, but in a different level from the original :JO command. For example, control has transferred from PROG1 to PROG2. PROG2 contains :EO or :JO command. ssssss is the file name or logical unit number where :EO or :JO occurred.	Examine job, correct (if necessary), and re-run job.

Table B-2. Unnumbered Error Messages (Continued)

COMMAND	ERROR MESSAGE	MEANING	CORRECTIVE ACTION
:RU,program	*ABEND JOB LIMIT	The job time limit (set via the :JO command) has been exceeded.	Check program for errors and/or extend job time limit.
	ABEND RUN LIMIT	The run time limit (set via the :TL command) has been exceeded.	Check program for errors and/or extend run time limit.
	FMGR WAITING ON LU xx	LU xx is down locked.	Up the EQT associated with LU xx or unlock the LU.

*This message can occur at any time during execution of a job.

SPOOL ERRORS

Error conditions occurring during spool processing result in error code or error message reports. These error reports are discussed in the following paragraphs.

SPOOL I/O ABORT ERRORS

Spool I/O abort error conditions result in the display of error codes in the form:

IOnn

where nn is an error number. Table B-3 defines these error codes.

Table B-3. Spool I/O Abort Error Codes

ERROR CODE	MEANING	ACTION
I020	Read attempted on write only spool file.	Revise program and re-run.
I021	Read attemped past end-of-file (EOF).	Revise program and re-run.
I022	Second attempt to read JCL card from batch input file by other than FMGR.	Revise program and re-run.
I023	Write attempted on read only spool file.	Revise program and re-run.
I024	Write attempted beyond end-of file (EOF): usually, spool file overflow.	Obtain more spool room on disc (See PK command, Chapter 2 or do not use spooling at this time.
I025	Attempt to access spool LU that is not currently set up.	May be caused by GASP KS command - if other reason, correct offending programs.
I026	Session LU points to system LU 255.	May be caused by GASP KS command.

SMP ERROR MESSAGES

Error messages produced by SMP are reported in the form:

SMP: error message

where the error message reported is defined in Table B-4.

Table B-4. SMP Error Messages

ERROR MESSAGE	MEANING	ACTION
SMP:LU xx EOFER filename	File filename just outspooled to logical unit xx overflowed or was otherwise incomplete.	Re-run the JOB.
SMP:LU xxDOWN filename HELD	Logical unit xx down: file-name placed in active hold.	Correct LU down condition and use GASP to restart operation or release hold status on file.
SMP:FMP .-nn	FMP error .-nn occurred during SMP operation (see Table B-1). Usually indicates loss of JOBFIL of SPLCON.	Use GASP to deallocate and reallocate the spool files.

OUTSPOOL ERROR MESSAGES

Errors encountered during outspool operations result in the messages defined in Table B-5.

Table B-5. Outspool Error Messages

MESSAGE	CAUSE	CORRECTIVE ACTION
JOB WAIT ON PT	End-of-tape occurred between :JO and :EO commands.	Load remainder of job in reader, ready the reader, and enter *GO,JOB.
JOB WAIT ON SPOOL RESOURCE	Required spool file or logical device cannot be obtained at this time.	None required. JOB will suspend and be automatically rescheduled when the resource becomes available.
JOB WAIT ON EXTENT	Spool file overflows available disc space.	Condition will automatically clear when SMP releases spool files as a result of outspool completion; or you can force a retry using the GASP command, SU; or you can abort JOB.
END JOB ABNORM	JOBFIL could not be opened; or other uncorrectable error occurred; or JOB was run before Spool initialization.	Try re-initialization with GASP after all spool activity is completed.
BAD EOF	Message appears after last line of file. ASCII file outspooling overflowed; or was otherwise incomplete.	Rerun JOB.

GASP ERROR CODES

GASP errors are reported as either negative or positive codes; negative when an FMP interface routine used by the command finds an error, positive as a direct result of the command. Most positive GASP error codes result from illegal syntax, most negative error codes from file access problems. Note that all the negative codes correspond to FMP codes.

Error messages are not issued for SMP call errors. Improper spool setup is diagnosed by a 0 returned in parameter ISLU; other spool calls are ignored should they be improperly specified.

A complete list of GASP calls can be requested by entering ??,99 in response to the GASP prompt. These messages are described in detail in Table B-6.

TABLE B-6 GASP Error Codes

ERROR CODE	ERROR MESSAGE	MEANING AND CORRECTIVE ACTION	ROUTINE OR COMMAND
-001	DISC ERROR	Disc is down; try again and then report problem to system manager.	Any GASP command that tries to open or access JOBFIL or SPLCON (all except ?? or EX); in particular, GASP initialization or DA.
-002	DUPLICATE FILE NAME	JOBFIL or SPLCON or spool pool file already created, or more than one spool file with same name. User.group must be specified in the KS, RS, or CS command to identify the spool file.	
-004	MORE THAN 32767 RECORDS IN TYPE 2 FILE	Consult system manager.	
-006	CR OR FILE NOT FOUND OR NO ROOM	Generally, no room to create spool files.	
-007	BAD FILE SECURITY CODE	Consult system manager.	
-008	FILE OPEN OR LOCK REJECTED	Possibly,attempt to DeAllocate(DA) with spool system active; shut down spooling (SD) and try again.	
-012	EOF OR SOF ERROR	Consult system manager.	

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Table B-6. GASP Error Codes (Cont.)

CONTINUED FROM PREVIOUS PAGE

-013	DISC LOCKED	Cartridge containing JOBFIL or SPLCON locked;initialize or if already initialized, wait and try again.	see -001 thru -012 on previous page
-014	DIRECTORY FULL	No more room in file directory for spool file. Pack cartridge and re-run GASP.	Initialize GASP
-32	NOT ENOUGH ROOM ON DISC CARTRIDGE	Use another cartridge.	Initialize GASP
-33	DISC CARTRIDGE NOT FOUND	Mount cartridge.	Initialize GASP
-48	SMP CANNOT BE SCHEDULED	SMP program is not found or there is not a big enough partition to run SMP. The default for SMP is type 2 (realtime) and 6 pages in size.	DS,KS,SD
-52	SPOOL SHUTDOWN. SPOOL FILE SETUP FAILED.	Spool shutdown is in progress. A WR or BE spool file may not be setup at this time. Start up spooling using GASP SU command and then try the spool file setup.	Trying to set up a spool file.
0	NO ERROR	Informative message; no error.	General
1	DISC ERROR nn	Disc associated with nn is down; report problem to system manager.	Initialize GASP
2	NUMBER OUT OF RANGE	Number entered in GASP initialization inconsistent with previous entries or exceeds maximum specified at generation; check last entry and change.	Initialize GASP
3	BAD JOB NUMBER	Specified job number not currently assigned; re-enter command with valid job number.	AB,CJ,DJ

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		CONTINUED FROM PREVIOUS PAGE	
4	ILLEGAL STATUS	Command is not valid for current state of job or spool file; check status with DJ or DS.	CJ,CS,KS
5	ILLEGAL COMMAND	Command not recognized by GASP; check and re-enter command correctly.	Any unrecognizable command
6	NOT FOUND	Specified job or spool not currently assigned; check with DJ or DS.	AB,CJ,CS, DJ,KS,RS
7	GASP SEGMENT NOT FOUND	Required GASP segment is not installed in the system or not SP'd on the same cartridge as the GASP main.	Any except EX
43	LU NOT FOUND IN SST	New outspool LU specified was not found in user's Session Switch Table.	RS
46	INSUFFICIENT CAPABILITY	Session user had an insufficient capability to execute the GASP command.	CJ,AB,KS, LS,RS,SD, SU
54	MOUNT ALL SPOOL DISCS!	A disc cartridge must be mounted.	Any command accessing a spool file or spool control file
55	MISSING PARAMETER	Required parameter omitted; check and re-enter with parameter.	AB,CJ,CS, KS,RS
56	BAD PARAMETER	Specified parameter cannot be recognized; check parameter and re-enter.	Any except DA or EX
/GASP;	IRRECOVERABLE INITIALIZE ERROR	GASP is not a background program or SPOOL EQT extentions are less than 18 words long or SPOOL driver is not in system driver area.	During initialization process

Appendix C
Spooling Reference Information

Reference material frequently used in Batch-Spool System operation is organized in this appendix as follows:

Standard Session Logical Units
Standard Driver Types
JOBFIL Format
SPLCON Format

STANDARD SESSION LOGICAL UNITS

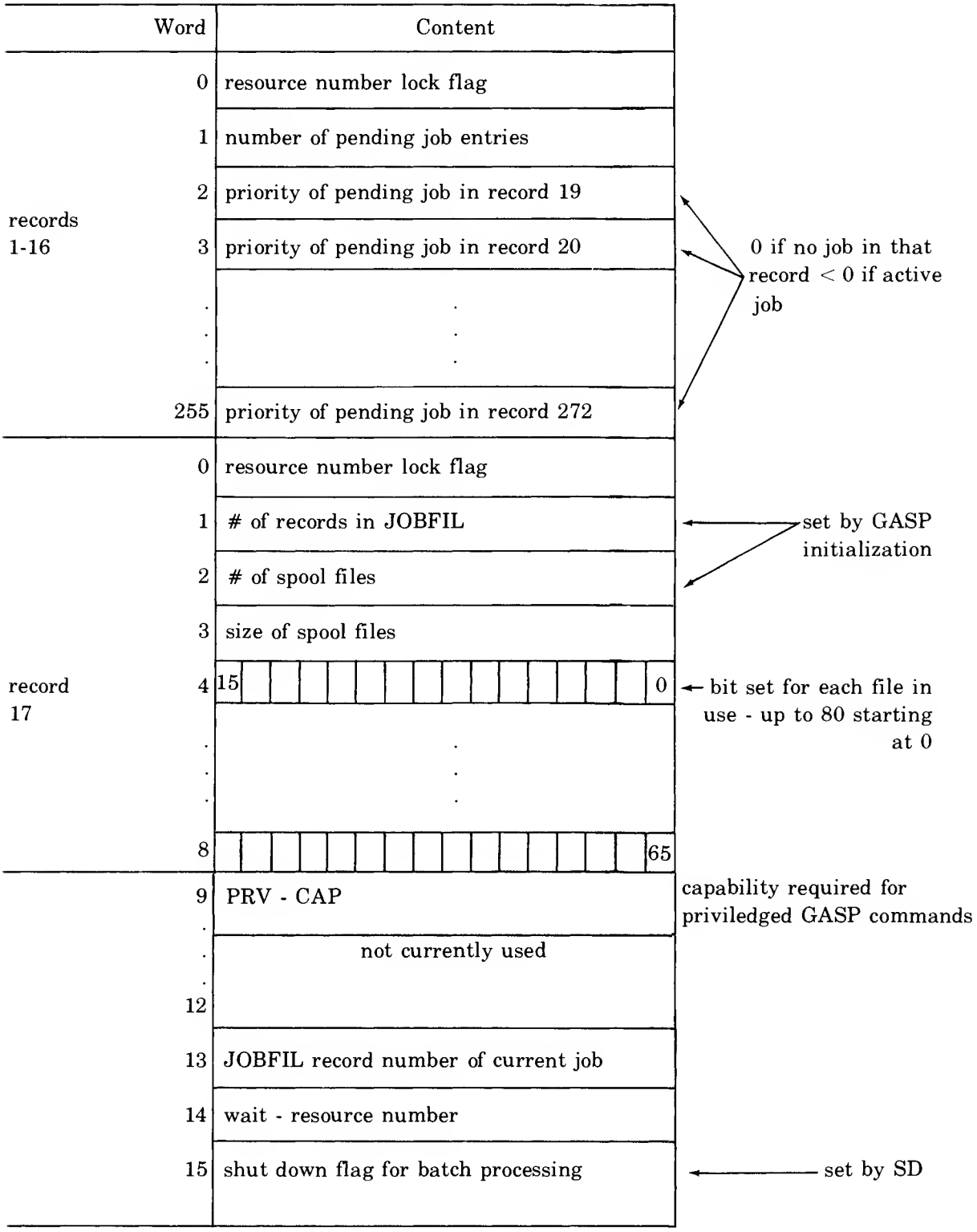
LOGICAL UNIT	DEVICE
1	session console
2	system disc
3	auxiliary disc
4	standard output
5	standard input
6	standard list
8	usually magnetic tape

STANDARD DRIVER TYPES

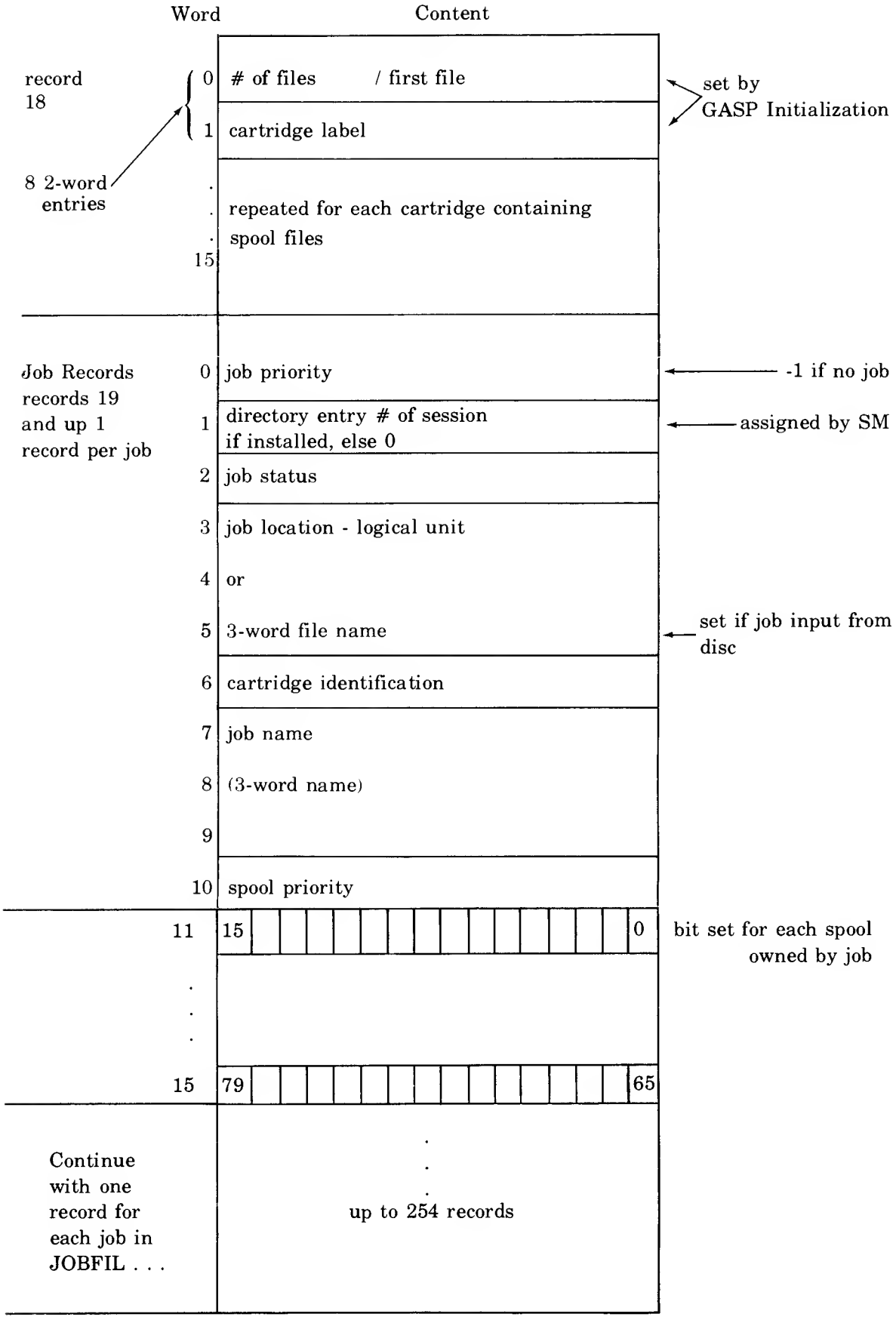
DRIVER	TYPE	DEVICE
DVR00	00	Teleprinter/CRT Display Terminal
	01	Paper Tape Reader
	02	Paper Tape Punch
DVR05	05	Page Mode CRT
DVR11	11	Card Reader
DVR12	12	Line Printer
DVR15	15	Mark Sense Reader
DVR23	23	9-Track Magnetic Tape
DVR31	31	Moving Head Disc
	32	Moving Head Disc
	33	Moving Head Disc

JOBFILE FORMAT

JOBFIL is a type 2 file with 16-word records. Records 1 - 16 list pending jobs with their priorities. Records 17 and 18 record JOBFIL size, spool file control, and spool location flags. Records 19 and up each describe one job.

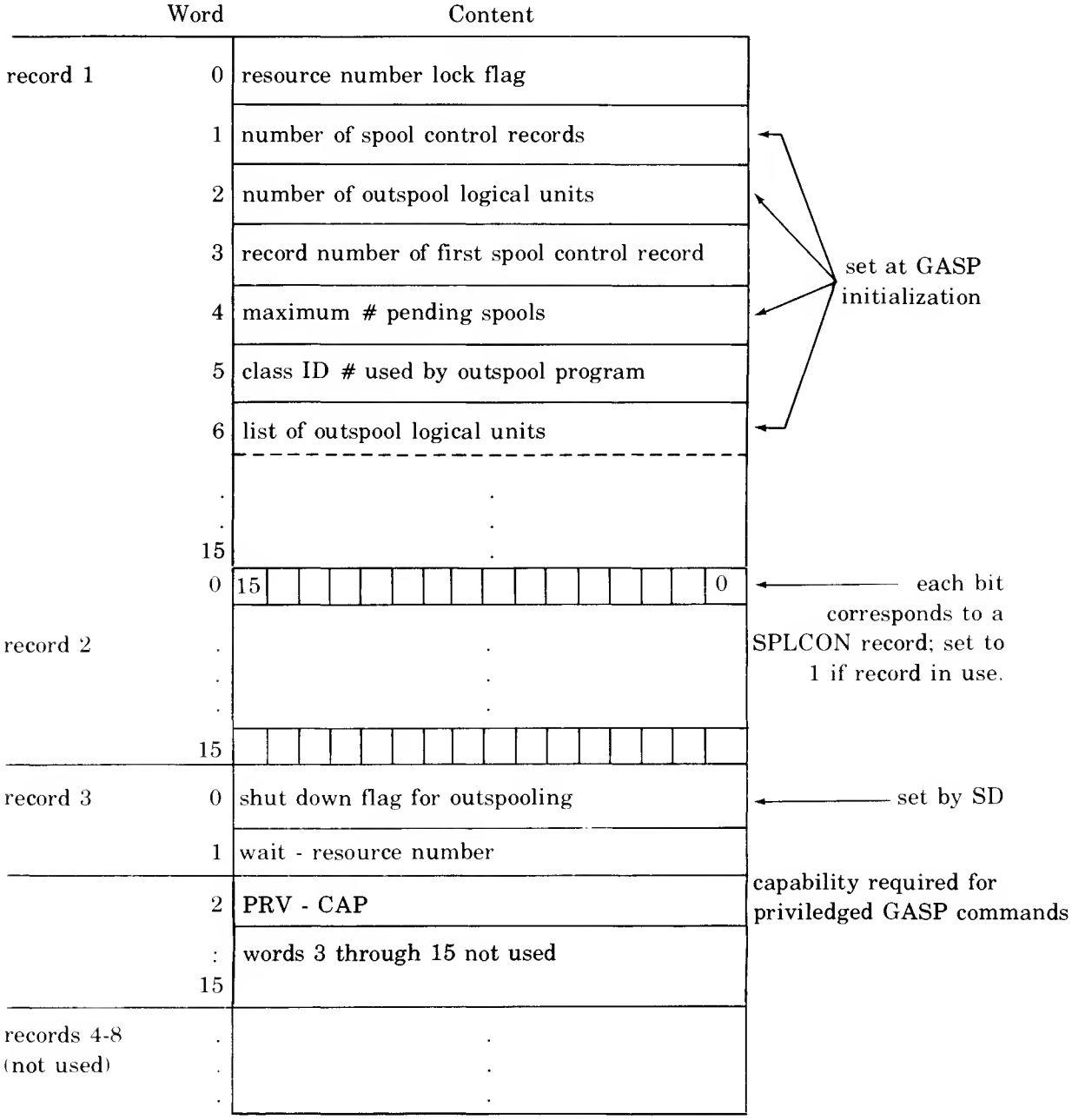


JOBFIL Format (Continued)

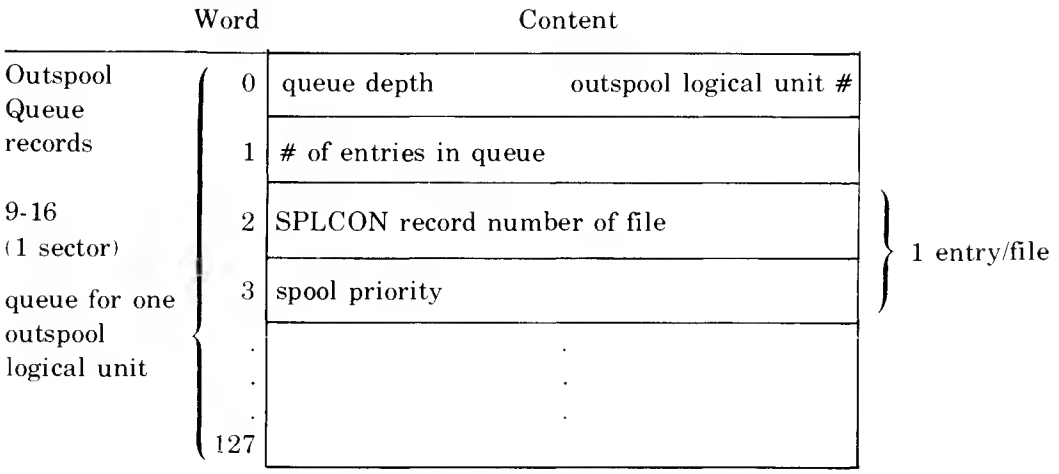


SPLCON FORMAT

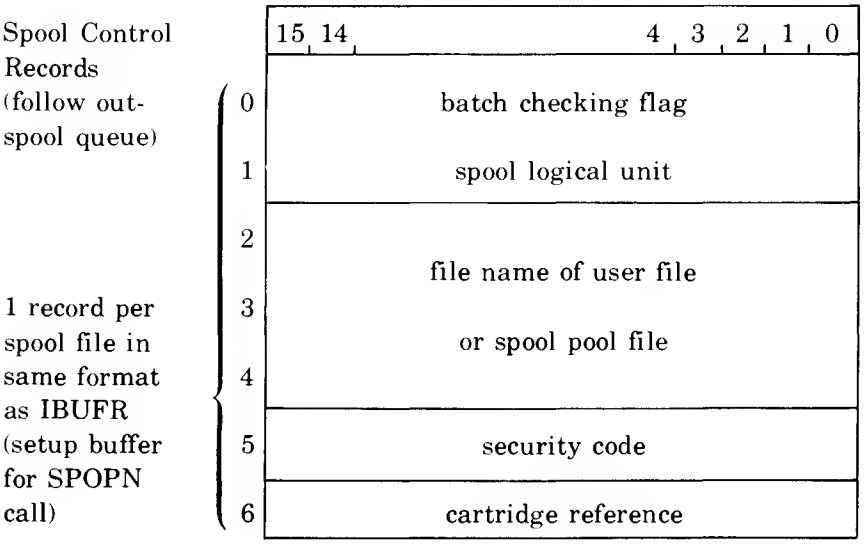
SPLCON is a type 2 file with 16-word records. It contains information on all active spool files and pending outspools, the outspool logical units and the available spool logical units.



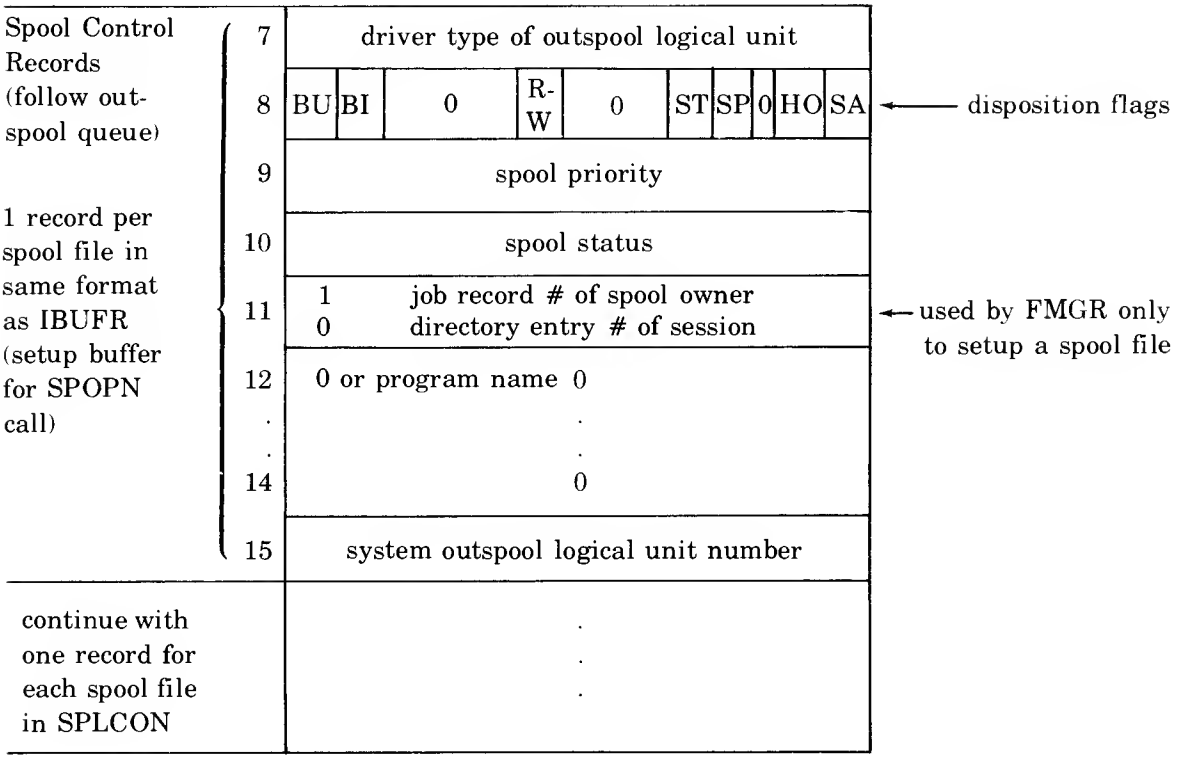
SPLCON Format (Continued)



continue with 1 sector (8 records) for each outspool logical unit assigned at GASP initialization.



SPLCON Format (Continued)



Disposition Flags (word 8):

SA = 1 save
0 purge at completion of spooling
HO = 1 hold until close
0 outspool immediately
SP = 1 spool pool file
0 user file
ST = 1 standard file format (no record headers on output)
0 spool format
R/W = 00 write and read
01 read only
10 write only
BI = 1 batch checking (used only by FMGR)
BU = 1 buffering
0 no buffering

Glossary

ABSOLUTE PROGRAM - A program that has been relocated and is capable of being loaded into main memory for subsequent execution. An "absolute program" is synonymous with "relocated program."

ABSOLUTE SYSTEM - The binary memory image of an RTE system (stored on Logical Unit 2).

ACCOUNT FILE - A disc resident file created and maintained by the System Manager. It contains information on all authorized session users and other session related information.

ADDRESS SPACE - See LOGICAL MEMORY or PHYSICAL MEMORY.

ASYNCHRONOUS DEVICE - A device that can perform I/O operations that are independent of time considerations but operates simultaneously with program execution. Interaction with the computer is through request/response circuitry.

AUXILIARY DISC SUBCHANNEL - An optional subchannel that is treated as a logical extension of the system disc subchannel, Logical Unit 2. If used, it is assigned to Logical Unit 3. The binary memory image of RTE-IVB may not reside on the auxiliary subchannel.

BACKGROUND (BG) - An arbitrary name for one of two types of partitions in RTE; generally used for lower priority programs whose responses to interrupts are not time-critical.

BASE PAGE - A 1024-word area of memory corresponding to logical page 0. It contains the system's communication area, driver links, trap cells for interrupt processing, and system and/or user program links.

BASE PAGE FENCE - A hardware register that divides a logical base page into a portion containing the user's base page and a portion of the system's base page.

BG - See BACKGROUND.

BIT BUCKET - Logical unit number pointing to Equipment Table entry number zero, which in turn, does not point to any existing device. I/O directed to the bit bucket is lost.

BLOCK - Two logical disc sectors of 128 bytes each, totaling a 256 bytes.

BOOT EXTENSION - An absolute program that resides on the first two sectors of logical track 0 of the system subchannel. The Boot Extension itself is first loaded into memory by the Bootstrap Loader or ROM Loader.

BOOT FILE - An optional file to which the Bootstrap Loader produced by the On-Line Generator is stored. This may be a disc file or a logical unit (e.g., a mini-cartridge).

BOOTSTRAP LOADER - A loader produced by the Generator and stored in the boot file. The Bootstrap Loader loads the Boot Extension into memory and then transfers control to the Boot Extension.

BOOT-UP - The process of bringing the Bootstrap Loader or ROM Loader contents into memory. Control is then transferred to the Boot Extension to begin the initializatrion process.

BUFFER - An area of memory (main-memory, mass memory or local peripheral memory) used to temporarily store data.

CAPABILITY LEVEL - An integer from 1 to 63 which defines the FMGR, System, and Break-Mode commands which a session user may execute.

CARTRIDGE - A set of contiguous cylinders on a disc unit. Cartridges contain disc files with a directory of the files stored on each cartridge. All files on the same FMP cartridge must have unique names. The system disc on logical unit 2 contains the RTE operating system, and may contain FMP files.

CHAINING - A technique for coordinating sequential execution of independent programs in the same portion of main memory.

CLASS I/O - A means of buffering data between devices and user programs, and between programs themselves, that permits a user program to continue execution concurrently with its own I/O. The term "I/O without program wait" is a more commonly used term.

CLOSE FILE - A method of terminating a program's access to a file so that no further read/write operations may be performed on the file.

COMMON - An area of memory that can be accessed by a program and its subprograms. Usually used to pass data from a program to a subprogram. In RTE, system COMMON may be used to pass data from one program to another.

CONFIGURATION TABLE - A set of default logical units associated with the station that a session user logs on at.

CONFIGURATOR - A two-part program that allows reconfiguration of an RTE system's I/O and physical memory structures without going through a new system generation. The configurator is initiated as an option during the startup process.

CURRENT PAGE - The memory page in which the executing instruction is located. Some 21MX memory reference instructions can only directly reference locations in two pages: current page and base page.

CYLINDER - The area that passes under all heads during one revolution of the disc surfaces.

DATA CONTROL BLOCK (DCB) - A table within an executable program that contains information used by the File Management Package (FMP) in performing disc accesses. (See the RTE Batch Spool Monitor Reference Manual.)

DCPC - See DUAL CHANNEL PORT CONTROLLER.

DEVICE DOWN - Relates to the state of a peripheral device or I/O controller. When the device is down, it is no longer available for use by the system. The term also refers to the DN operator command.

DEVICE INDEPENDENCE - Refers to the ability of a program to perform I/O without knowing which physical device is being accessed (see also Logical Unit Number).

DEVICE REFERENCE TABLE (DRT) - A table created during system generation corresponding to Logical Units 1 through 63. The contents of the Device Reference Table include a pointer to the associated EQT entry, subchannel number of the device, and information as to whether or not the device is locked. The table may be modified by the user through an LU command.

DEVICE TIMEOUT - A time interval associated with a specific I/O device. If the system expects a response from such a device and this response does not occur within the timeout period, the device is assumed to be inoperative by the system. This feature is necessary to prevent a program from getting "hung up" because it is waiting for a response from a non-functioning peripheral device.

DIRECT MEMORY ACCESS - See DUAL CHANNEL PORT CONTROLLER.

DIRECTORY - A list of programs and files currently stored on a disc subchannel that can be displayed by the user.

DISC - Strictly speaking, the term means the platter(s) with the storage medium only; however the term is also loosely used to mean the entire peripheral including the drive.

DISC-BASED - Refers to an operating system using a disc storage device as an integral part of the operating system.

DISC FORMATTING - The process by which physical track and sector addresses are written in the preamble of each disc track sector. Disc formatting may be performed by the appropriate disc diagnostic. After formatting is completed, the SWTCH program and Disc Backup utility may perform subchannel initialization.

DISC-RESIDENT - A term applied to programs in executable form (absolute) that are stored on disc and brought into main memory for execution by the system in response to a program or operator request, time-of-day schedule or an I/O interrupt.

DISC ROM BOOT - A loader residing in Read-Only Memory that loads (off-line) the Boot Extension from disc storage and transfers control to the Boot Extension. (See also BOOT EXTENSION and STARTUP.)

DISPATCHER - An RTE system module that selects, from the scheduled list, the highest priority program to be executed next. The dispatcher module loads the program into memory from disc (if the program is not already in memory) and transfers control to the program.

DMA - See DUAL CHANNEL PORT CONTROLLER.

DMS - See DYNAMIC MAPPING SYSTEM.

DORMANT PROGRAM - A dormant program is one that is "sleeping" or inactive. More specifically, in RTE it is a program that is neither executing, suspended nor scheduled.

DOWN - Status of a device controller EQT that is not available for use.

DRIVER - A software module that interfaces a device and its controller to an operating system. Drivers specified by EQT definitions will go into either a driver partition or into the System Driver area of memory.

DRIVER PARTITION - A block of memory that contains one or more drivers. In RTE-IV, all drivers are in physical memory; however, only the driver partition containing the driver currently being used is included (mapped) in the logical address space.

DRT - See DEVICE REFERENCE TABLE.

DUAL CHANNEL PORT CONTROLLER (DCPC) - A hardware accessory that permits an I/O process to transfer data to or from memory directly, or access memory, thus providing a much faster transfer of data. The operating system controls access to the DCPC channels.

DYNAMIC BUFFER SPACE - Additional buffer space allocated to a program after the program code itself. The additional size is determined by the user. Typically used only by assembly language program.

DYNAMIC MAPPING SYSTEM - A hardware accessory allowing partitioned memory systems to address memory configurations larger than 32K words of physical memory.

EMA - See EXTENDED MEMORY AREA.

EQT - See EQUIPMENT TABLE.

EQT EXTENSION - A method for increasing the size of an Equipment Table entry's buffer space, during system generation, that gives the specified I/O driver more words of storage space than are available in the EQT temporary storage area.

EQUIPMENT TABLE (EQT) - A table in memory associating each physical I/O device controller with a particular software processing routine (driver). For a given device, the EQT provides status information, temporary storage and parameter passing services (see also Device Reference Table and Interrupt Table).

EXEC - One of the RTE system modules that interfaces user programs to the operating system.

EXTENDABLE FILE - An FMP file that is automatically extended in response to a write request to points beyond the range of the currently defined file. An extent is created with the same name and size as the main, and the access is continued.

EXTENDED MEMORY AREA (EMA) - An area of physical memory that may extend beyond the user's logical address space and is used for large data arrays. Its size is limited only by the amount of physical memory available. An entire array is resident in physical memory although the entire array is not currently in the logical address space.

EXTERNAL REFERENCE - A reference to a declared symbolic name not defined in the software module in which the reference occurs. An external reference is satisfied by another module that defines the reference name by an entry point definition.

FILE - A defined section of memory on a storage device used to store data or programs.

FILE EXTENTS - See EXTENDABLE FILE.

FILE MANAGEMENT - The operating system functions associated with maintaining disc files (translating file names to physical disc memory areas; maintaining a directory; checking for security codes; etc.).

FILE MANAGEMENT PACKAGE (FMP) - A collection of subprograms used to access, control and maintain files.

FILE MANAGER (FMGR) - A program that provides FMP file creation, access and manipulation services through FMGR commands entered by the user.

FMGR - See FILE MANAGER.

FMP - See FILE MANAGEMENT PACKAGE.

FOREGROUND - A purely arbitrary name for one of the two types of partitions in RTE; generally used for higher-priority programs. The "foreground" area is synonymous with the real-time area.

GLOBAL TRACKS - Global tracks are a subset of system tracks and are accounted for in the track assignment table. Any program can read/write or release a global track (i.e., programs can share global tracks).

HP-IB - The Hewlett-Packard version of the IEEE standard 488-1975 Digital Interface for Programmable Instrumentation. The HP-IB provides two-way communication between instruments and/or between computers, instruments, or peripherals.

ID SEGMENT - A block of words, associated with each resident program, that is used by the system to keep track of the program's name, software priority field, current scheduling status and other characteristics. Every program must have its own ID segment.

ID SEGMENT EXTENSION - A method for increasing the size of an ID segment to save additional information about its associated program. The extensions are used only for EMA programs (see EMA). ID segment extensions are automatically allocated by the generator or loader, but only if sufficient ID segment extensions were specified during system generation.

INTERRUPT - The process (usually initiated by an I/O device controller) that causes the computer to signal an executing program, in an orderly fasnion, for the purpose of transferring information between a device and the computer.

INTERRUPT LOCATION - A single memory location whose contents (always an instruction) are executed upon interrupt by an I/O device controller (same as trap cell).

INTERRUPT TABLE (INT) - A table that associates interrupt links with the octal select codes of peripheral devices to specific EQT entries or programs.

I/O - A general term referring to any activity between a computer and its peripheral devices.

I/O CONTROLLER - A combination of interface card(s), cable, and (for some devices) controller box used to control one or more I/O devices.

I/O DEVICE - A physical unit defined by an EQT entry (I/O controller) and subchannel.

I/O WITHOUT WAIT - See CLASS I/O.

KEYWORD TABLE - A table of ID segment addresses.

LG AREA - A group of tracks used to temporarily store relocatable code that can be accessed by the File Manager.

LIBRARY - A collection of relocatable subroutines that perform commonly-used (e.g., mathematical) functions. Subroutines are appended to referencing programs or are placed in the memory resident library for access by memory resident programs.

LOADER - A program that converts the relative addresses of relocatable programs to absolute addresses compatible with the memory layout of a particular system.

LOCAL COMMON - An area of COMMON appended to the beginning of a program and accessible only by that program, its subroutines or segments. This type of COMMON can be specified only during on-line relocation by the loader (LOADR).

LOCKED DEVICE - See LOGICAL UNIT LOCK.

LOCKED FILE - A file opened exclusively to one program and therefore not currently accessible to any other program.

LOGICAL MEMORY - Logical memory is the 32K-word (maximum) address space described by the currently enabled memory map. If the System Map is enabled, it describes those areas of physical memory necessary for the operation of RTE-IV. When the User Map is enabled, it describes those areas needed by the currently executing program. DCPC maps describe the address space to/from which the transfer is taking place.

LOGICAL UNIT LOCK - A mechanism for temporarily acquiring exclusive use of an I/O device or devices by a program, to ensure its I/O completion before being preempted by a another program.

LOGICAL UNIT NUMBER (LU) - A number used by a program to refer to an I/O device. Programs do not refer directly to the physical I/O device select code number, but rather through the LU number that has a cross-reference to the device.

LOG-OFF - The process by which a session is terminated.

LOG-ON - The process by which a session is initiated. The Log-On process involves checking the session user's identification to allow access to the system, and the creation of the user's operating environment through the User HELLO File and Session Control Block.

LU - See LOGICAL UNIT NUMBER.

MAILBOX I/O - A Class I/O term applied to a protected buffer that keeps track of the "sender" and "receiver" program for each block of data in the buffer used in program-to program communication.

MAIN PROGRAM - The main body of a user program (as opposed to the whole program, which may include subroutines or segments).

MAP - Applied to 21MX or XE machines, the term applies to a set of 32 registers that point to 32 pages of physical memory defining a 32K-word logical address space.

MAPPING SEGMENT (MSEG) - The area of an EMA that is currently accessible within the user program's logical address space.

MEMORY PROTECT - A hardware accesory that allows an address (memory protection fence) to be set so that when in protected mode, the locations below that address cannot be accessed by writes or JSB/JMP instructions.

MEMORY-RESIDENT LIBRARY - A collection of reentrant or privileged library routines available only to memory resident programs (in RTE-IV). These routines are included in the disc-resident relocatable library for appending to disc-resident programs.

MEMORY-RESIDENT PROGRAM - A program that executes from a designated area in physical memory and remains in memory, as opposed to a disc-resident program that may be swapped out to the disc or loaded from the disc to another area in memory. Memory resident programs are loaded during system generation (only), and usually are high priority programs with short execution times.

MOTHER PARTITION - A partition that may be larger than the maximum logical address space and which may consist of a group of subpartitions. The subpartitions allow many smaller programs to use the memory when the mother partition is not active.

MSEG - See MAPPING SEGMENT.

MULTIPROGRAMMING - A technique whereby two or more routines or programs may be executed concurrently by an interleaving process, using the same computer. Multiprogramming is an attempt to improve equipment efficiency by building a queue of demands for resources, achieved by having available in main memory more than one task waiting for resource usage. The concurrent tasks are then multiplexed among each other's wait time intervals.

MULTI-TERMINAL MONITOR - A system software module that provides for interactive program development and editing in a multi-terminal environment controlled by a single computer.

OFF-LINE - Refers to use of the computer and/or I/O devices by resources other than the RTE operating system or subsystems.

ON-LINE - Refers to software or I/O devices recognized and controlled by the main operating system at the time they are being used.

ON-LINE GENERATOR - A program that permits use of an existing RTE operating system's services to generate a new system from relocatable software modules found in the File Manager Area. System control can then be transferred to the new operating system through use of a program called SWTCH. (See RTE-IVB On-Line Generator Reference Manual.)

ON-LINE LOADING - The relocation of programs through use of the Relocating Loader (see RELOCATION).

OPEN FILE - A method of gaining access to a specific file to perform a read/write instruction.

OPERATOR'S CONSOLE - See SYSTEM CONSOLE.

OPERATING SYSTEM - An organized collection of programs designed to optimize the usage of a computer system. It provides the means by which user programs interact with hardware and other software. (See also REAL-TIME EXECUTIVE.)

OVERLAYS - Also called segments,these are routines that share the same portion of main memory and are called into memory by the program itself (see SEGMENTED PROGRAMS).

PAGE - The largest block of memory (1024 words) that can be directly addressed by the address field of a one-word memory reference instruction.

PARTITION - A predefined block of memory with a fixed number of pages (redefinable at system boot-up) located in the disc resident program area of memory. The user may divide the disc resident program area into as many as 64 partitions that can be classified as a mixture of real-time and background, all real-time, or all background. Disc-resident programs run in partitions and at least one partition of sufficient size must be defined during system generation to run disc resident programs.

PERIPHERAL DISC SUBCHANNEL - A disc subchannel available to the user for read/write operations but for which RTE-IVB does not manage nor maintain a track assignment table. It is the user's responsibility to manage these tracks; however, the File Manager may be used to manage peripheral subchannel tracks. A peripheral subchannnel must have a logical unit number assignment greater than 6.

PHYSICAL MEMORY - Physical memory is the total amount of memory defined at generation or reconfiguration time. It refers to the actual memory in the computer; e.g., page 67 of physical memory is associated with a certain block of actual hardware, whereas the same page might be referred to as "page 5" in a particular block of logical memory.

POWER FAIL/AUTO-RESTART - The ability for a computer to save the current state of the system in permanent memory when power is lost, and to restore the system to defined conditions when power returns.

PRIORITY - A regulation of events allowing certain actions to take precedence over others in case of timing conflicts.

PRIVILEGED DRIVERS - I/O drivers whose interrupts are not processed by the RTE operating system. Such drivers offer improved response time but must perform their own internal housekeeping; i.e., saving status upon interrupt.

PRIVILEGED INTERRUPTS - Interrupts that by-pass normal interrupt processing to achieve optimum response time for interrupts having the greatest urgency. Privileged interrupts are handled by privileged I/O drivers.

PRIVILEGED SUBROUTINE - A privileged subroutine executes with the interrupt system off (and therefore by-passes the operating system). It allows high-speed processing at the cost of losing use of operating system housekeeping services and real-time response.

PROGRAM STATE - Refers to the status of an executable program at any given time. A user program is always in one of four possible states: executing, scheduled, suspended or dormant.

PROGRAM SWAPPING - See Swapping.

PURGE - Refers to the act of instructing an operating system to delete a file or program from its directory. Usually used with reference to disc files.

REAL-TIME (RT) - An arbitrary name for one of the two types of partitions in RTE; generally used for higher-priority programs. The real-time area is synonymous with the "foreground" area.

REAL-TIME EXECUTIVE - A collection of software modules comprising the total operating system; e.g., EXEC, SCHED, RTIOC, I/O drivers and various tables. For all practical purposes, Real-Time Executive, operating system and RTE are synonymous terms.

RECORD - A logical subdivision of a file that contains zero or more words, and is terminated by an end-of-record mark.

REENTRANT - Refers to a routine that can be shared by a number of programs simultaneously; i.e., one program can be interrupted in its usage of the routine to permit a higher-priority program to utilize the routine. The first program can then reenter the routine at the point where it was interrupted.

RELOCATABLE LIBRARIES - A collection of commonly-used subroutines in relocatable format. For example:

System Library - subroutines that are appended to each user program and that are unique to the operating system. This allows a user to write programs using operating system routines but which are independent of the operating system for subroutine execution.

DOS/RTE Relocatable Library - a collection of utility subroutines that are primarily accessed by FORTRAN and Assembly Language programs.

FORTRAN Formatters - format subroutines for FORTRAN I/O operations and other programming languages.

RELOCATING LOADER (LOADR) - A HP-supplied program that sets up communications links and forms an absolute load module from a relocatable program. LOADR creates the relocated program in conformance with current system constraints and loader commands entered by the user.

RESOURCE MANAGEMENT - A feature that allows the user to manage a specific resource shared by a particular set of cooperating programs.

RESPONSE TIME - The total amount of time required to bring a real-time program or routine into execution in response to an interrupt, interval timer, call from another program or operator call. Response time is usually measured in microseconds to milliseconds.

ROM BOOT - A loader residing in Read-Only Memory that on-line loads the Boot Extension from disc storage and transfers control to the Boot Extension. The Boot Extension must reside on the disc physical unit 0, track 0, sector 0. (See also Boot Extension and Startup definitions.)

RTE - See REAL-TIME EXECUTIVE.

SAM - See SYSTEM AVAILABLE MEMORY.

SCB - See SESSION CONTROL BLOCK.

SCHEDULING - Entering a program in the schedule list for execution, either at the next entry into the dispatcher, or at the appropriate time when the program's priority is high enough.

SEGMENTED PROGRAM - A technique for accommodating programs larger than the available logical memory. "Segment" refers to those slices of the program that are brought into main memory as required, and overlay the previous segment.

SELECT CODE - An octal number (10 through 77) that specifies the address of an I/O device interface card.

SESSION CONTROL BLOCK (SCB) - A variable-length table built in physical memory by the log-on processor for each session.

SESSION IDENTIFIER - A number by which the system identifies each session. Typically it is the system logical unit number of the terminal on which the session user has logged on.

SESSION SWITCH TABLE (SST) - A table which defines a session's total I/O addressing range. It provides a mapping between Session Logical Unit numbers which the user addresses and System Logical Unit numbers which is where the system processes the call.

SIMULTANEOUS PERIPHERAL OPERATIONS ON-LINE (SPOOL) - An RTE feature generally associated with batch operations. There is both in-spooling and out-spooling . In-spooling consists of a program and data being first read in from some peripheral device and placed on the disc. Program reads are translated to disc reads instead of reads from the peripheral device. Program writes are also translated to disc writes instead of peripheral device writes, so that program output is on disc. Out-spooling is the process of taking the program's output from disc to the appropriate peripheral device.

SPARE CARTRIDGE POOL - A set of cartridges defined by the System Manager as being available to session users for temporary disc space.

SST - See SESSION SWITCH TABLE.

STARTUP - The startup process is initiated by the Boot Extension. During the startup process, the tables, registers and pointers required by the system are established. Control is then transferred to the Configurator.

STATION - A terminal and its associated peripheral devices.

SUBCHANNEL - One of a group of I/O devices connected to a single I/O controller. For example, RTE driver DVR23 can operate more than one magnetic tape drive through subchannel assignments. In the case of moving head discs, contiguous groups of tracks are treated as separate subchannels. For example, a 7905 disc platter may be divided into four subchannels. Each subchannel is referenced by an LU number.

SUBCHANNEL INITIALIZATION - The process of preparing a disc subchannel for use by the RTE operating system.

SUBCHANNEL NUMBERS - Decimal numbers (0-31) associated with the LU numbers of devices with multiple functions on the same device. Each subchannel number is associated with a specific subchannel; e.g., a 2645A terminal could have four subchannels: one for the keyboard, one each for the right and left tape channels, and one for an optional line printer.

SUBPARTITIONS - Partitions that are optional subdivisions of a mother partition. Subpartitions have the same type (RT or BG) as the mother partition. Subpartitions are treated like other partitions except that they cannot be used while the mother partition contains an executing program.

SUBSYSTEM GLOBAL AREA (SSGA) - An area of memory that consists of all Type 30 modules loaded at generation time. The area is included in the system address space and in the address spaces of programs that access it (Types 17-20, and Types 25-28). The area may be used for data (i.e., COMMON).

SWAPPING - A technique whereby an executing program is suspended and transferred to mass storage (because another program needing the same portion of memory has been scheduled). When the interrupting program has terminated, becomes suspended, or becomes eligible to be swapped out, the previously swapped program may be reloaded into memory and resumes execution at the point where it was suspended.

SWTCH PROGRAM - A system utility program that transfers an RTE-IV operating system to a specific disc area from which it can be booted up.

SYNCHRONOUS DEVICE - Devices that perform I/O operations in a fixed timing sequence, regardless of the readiness of the computer.

SYSTEM AVAILABLE MEMORY (SAM) - A temporary storage area used by the system for class I/O, reentrant I/O, automatic buffering and parameter string passing.

SYSTEM COMMON - An area of memory that is sharable by programs.

SYSTEM CONSOLE - The interactive console or terminal (LU1) that controls system operation and from which all system and utility error messages are issued. In a multi-terminal environment, a system console is distinguished from "user consoles" from which users develop programs.

SYSTEM DISC SUBCHANNEL - The disc subchannel assigned to Logical Unit 2 that contains the memory image of the RTE-IVB system.

SYSTEM DRIVER AREA - An area for privileged drivers, very large drivers, drivers that do their own mapping or drivers not included in driver partitions. It is included in the system's address space, in the address space of RT and Type 3 BG programs, and optionally in the address space of memory resident programs.

SYSTEM MAP - The 32K-word address space used by the operating system during its own exectuion.

SYSTEM TRACKS - All subchannel tracks assigned to RTE-IVB for which a contiguous track assignment table is maintained. These tracks are located on Logical Unit 2 (system), and 3 (auxiliary).

TABLE AREA I - An area of memory that is included in all address spaces and which includes the EQTs, Device Reference Table, Interrupt Table, Track Map Table, all Type 15 modules, and some system entry points.

TABLE AREA II - An area of memory that contains the system tables, ID segments, all Type 13 modules, and some system table and entry points. Table Area II is included in the address space of the system, real-time programs, Type 3 background programs, and (optionally) memory resident programs.

TIME BASE GENERATOR (TBG) - A hardware module (real-time clock) that generates an interrupt in 10 millisecond intervals. It is used to trigger execution of time-scheduled user programs at pre-determined intervals and for device time-outs.

TIME-OUT - Relating to the state of a peripheral device. When the device has timed-out, it is no longer available for system use (down). Also (noun) the parameter itself; the amount of time RTE will wait for the device to respond to an I/O transfer command before making the device unavailable.

TIME SCHEDULING - The process of automatically scheduling a program for execution at pre-determined time intervals. Program scheduling is established through use of the IT command, and requires that the Time Base Generator be installed in the CPU.

TIMESLICING - A means by which compute bound programs can be prevented from monopolizing CPU time. A timesliced program is placed in a round-robin queue with other programs of the same priority. Each program in the queue gets a quantum of CPU time to execute before another program gets its turn. Higher priority programs can interrupt any timesliced program at any time.

UP - See DEVICE UP.

USER HELLO FILE - A procedure file that control is automatically transferred to when the session user first logs on to the system.

USER MAP - The 32K-word address space used by a user program during its execution.

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Bureau de Vente de Lille
Immeuble Péricentre
Rue Van Gogh
F-59650 **VILLENEUVE D'ASQ**
Tel: (20) 91-41-25
Telex: 160124F
CM,CS,E,MS,P*

GERMAN FEDERAL REPUBLIC

Hewlett-Packard GmbH
Technisches Büro Berlin
Keithstrasse 2-4
0-1000 **BERLIN** 30
Tel: (030) 24-90-B6
Telex: 018 3405 hpbln d
A,CM,CS,E,X,M,P

Hewlett-Packard GmbH
Technisches Büro Böblingen
Herrenberger Strasse 110
0-7030 **BÖBLINGEN**
Tel: (07031) 667-1
Telex: 07265739 bbn or 07265743
A,CM,CP,E,MP,P

Hewlett-Packard GmbH
Technisches Büro Ousseldorf
Emanuel-Leutze-Strasse 1
0-4000 **DUSSELDORF**
Tel: (0211) 5971-1
Telex: 085/86 533 hpdd d
A,CM,CP,E,MS,P

Hewlett-Packard GmbH
Vertriebszentrale Frankfurt
Berner Strasse 117
Posffach 560 140
0-6000 **FRANKFURT** 56
Tel: (0611) 50-04-1
Telex: 04 13249 hpffm d
A,CM,CP,E,MP,P

Hewlett-Packard GmbH
Technisches Büro Hamburg
Kapstadtring 5
0-2000 **HAMBURG** 60
Tel: (040) 63804-1
Telex: 21 63 032 hphh d
A,CM,CP,E,MS,P

Hewlett-Packard GmbH
Technisches Büro Hannover
Am Grossmarkt 6
0-3000 **HANNOVER** 91
Tel: (0511) 46-60-01
Telex: 092 3259
A,CM,CS,E,MS,P

Hewlett-Packard GmbH
Technisches Büro Mannheim
Rosslauer Weg 2-4
0-6800 **MANNHEIM**
Tel: (621) 70050
Telex: 0462105
A,C,E

Hewlett-Packard GmbH
Technisches Büro Neu Ulm
Messerschmittstrasse 7
0-7910 **NEU ULM**
Tel:
Telex:
C,E

Hewlett-Packard GmbH
Technisches Büro Nürnberg
Neumeyerstrasse 90
0-8500 **NÜRNBERG**
Tel: (0911) 56-30-83
Telex: 0623 860
CM,CS,E,MS,P

Hewlett-Packard GmbH
Technisches Büro München
Eschenstrasse 5
0-B021 **TAUFKIRCHEN**
Tel: (0B9) 6117-1
Telex: 0524985
A,CM,CP,E,MS,P

GREAT BRITAIN

Hewlett-Packard Ltd.
Trafalgar House
Navigation Road
ALTRINCHAM
Chesire WA14 1NU
Tel: (061) 928-6422
Telex: 66806B
A,C,E,M

Hewlett-Packard Ltd.
Oakfield House, Oakfield Grove
Clifton
BRISTOL BS8 2BN
Tel: 36B06
Telex: 444302
P

Hewlett-Packard Ltd.
14 Wesley Street
CASTLEFORD
Yorkshire WF10 1AE
Tel: (0977) 550016
Telex: 5557355
C

Hewlett-Packard Ltd.
Fourier House
257-263 High Street
LONDON COLNEY
Herts., AL2 1HA
Tel: (0727) 24400
Telex: 1-B952716
C,E

Hewlett-Packard Ltd
Tradax House, St. Mary's Walk
MAIDENHEAD
Berkshire, SL6 1ST
Tel: (0628) 39151
E,P

Hewlett-Packard Ltd.
308/314 Kings Road
READING, Berkshire
Tel: 61022
Telex: 84-80-68
CM,P

Hewlett-Packard Ltd.
Quadrangle
106-118 Station Road
REDHILL, Surrey
Tel: (0737) 68655
Telex: 947234 C,E

Hewlett-Packard Ltd.
Westminster House
190 Strafford Road
SHIRLEY, Solihull
West Midlands B90 3BJ
Tel: (021) 7458800
Telex: 339105
C

Hewlett-Packard Ltd.
King Street Lane
WINNERSH, Wokingham
Berkshire RG11 5AR
Tel: (0734) 784774
Telex: 847178
A,C,E,M

GREECE

Kostas Karaynnis
8 Omirou Street
***ATHENS** 133*
Tel: 32-30-303, 32-37-371
Telex: 21 59 62 RKAR GR
E,M,P

"Plaiso"
G. Gerados
24 Stournara Street
ATHENS
Tel: 36-11-160
Telex: 21 9492
P

GUATEMALA

IPESA
Avenida Reforma 3-48
Zona 9
GUATEMALA CITY
Tel: 316627, 314786, 664715
Telex: 4192 Teletro Gu
A,C,CM,E,M,P

HONG KONG

Hewlett-Packard Hong Kong, Ltd.
G.P.O. Box 795
5th Floor, Sun Hung Kai Centre
30 Harbour Road
HONG KONG
Tel: 5-8323211
Telex: 66678 HEWPA HX
Cable: HP ASIA LTO Hong Kong
E,CP,P

Schmidt & Co. (Hong Kong) Ltd.
Wing On Centre, 28th Floor
Connaught Road, C.
HONG KONG
Tel: 5-455644
Telex: 74766 SCHMX HX
A,M

ICELAND

Elding Trading Company Inc.
Hafnarnvoli-Tryggvagotu
P.O. Box 895
IS-REYKJAVIK
Tel: 1-58-20, 1-63-03
M

INDIA

Blue Star Ltd.
Bhavdeep
Stadium Road
***AHMEDABAD** 380 014*
Tel: 42932
Telex: 012-234
Cable: BLUEFROST
E

Blue Star Ltd.
11 Magarath Road
***BANGALORE** 560 025*
Tel: 55668
Telex: 0845-430
Cable: BLUESTAR
A,CM,C,E

Blue Star Ltd.
Band Box House
Prabhadevi
***BOMBAY** 400 025*
Tel: 422-3101
Telex: 011-3751
Cable: BLUESTAR
A,M

Blue Star Ltd.
Sahas
414/2 Vir Savarkar Marg
Prabhadevi
***BOMBAY** 400 025*
Tel: 422-6155
Telex: 011-4093
Cable: FROSTBLUE
A,CM,C,E,M

Blue Star Ltd.
7 Hare Street
***CALCUTTA** 700 001*
Tel: 12-01-31
Telex: 021-7655
Cable: BLUESTAR
A,M

Blue Star Ltd.
Meenakshi Mandiram
XXXXV/1379-2 M. G. Road
***COCHIN** 682-016*
Tel: 32069
Telex: 085-514
Cable: BLUESTAR
*A**

Blue Star Ltd.
133 Kodambakkam High Road
***MADRAS** 600 034*
Tel: 82057
Telex: 041-379
Cable: BLUESTAR
A,M

Blue Star Ltd.
Bhandari House, 7th/8th Floors
91 Nehru Place
***NEW DELHI** 110 024*
Tel: 682547
Telex: 031-2463
Cable: BLUESTAR
A,CM,C,E,M

Blue Star Ltd.
1-1-117/1 Sarojini Devi Road
***SECUNDERABAD** 500 033*
Tel: 70126
Telex: 0155-459
Cable: BLUEFROST
A,E

Blue Star Ltd.
T.C. 7/603 Poornima
Maruthankuzhi
***TRIVANDRUM** 695 013*
Tel: 65799
Telex: 0884-259
Cable: BLUESTAR
E

INDONESIA

BERCA Indonesia P.T.
P.O.Box 496/Jkt.
Jin. Abdul Muis 62
JAKARTA
Tel: 373009
Telex: 31146 BERSAL IA
Cable: BERSAL JAKARTA
A,C,E,M,P

BERCA Indonesia P.T.
P.O. Box 174/Sby.
J.L. Kutei No. 11
SUBAEE-SURABAYA
Tel: 68172
Telex: 31146 BERSAL SO
Cable: BERSAL-SURABAYA
A,E,M,P*

IRAQ

Hewlett-Packard Trading S.A.
Mansoor City 9B/3/7
BAGHDAD
Tel: 551-49-73
Telex: 2455 HEPAIRAQ IK
CP

IRELAND

Hewlett-Packard Ireland Ltd
Kestrel House
Clanwilliam Court
Lower Mount Street
DUBLIN 2, Eire
Tel: 680424, 6B0426
Telex: 30439
A,C,CM,E,M,P

Cardiac Services Ltd.
Kilmore Road
Artane
***DUBLIN** 5, Eire*
Tel: (01) 351820
Telex: 30439
M

SALES & SUPPORT OFFICES

Arranged alphabetically by country

ISRAEL

Electronics Engineering Division
Motorola Israel Ltd.
16 Kremenetski Street
P.O. Box 25016
TEL-AVIV 67899
Tel: 338973
Telex: 33569 Motil IL
Cable: BASTEL Tel-Aviv
A,CM,C,E,M,P

ITALY

Hewlett-Packard Italiana S.p.A.
Traversa 99C
Giulio Petrone, 19
I-70124 **BARI**
Tel: (080) 41-07-44
M

Hewlett-Packard Italiana S.p.A.
Via Martin Luther King, 38/111
I-40132 **BOLOGNA**
Tel: (051) 402394
Telex: 511630
CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.
Via Principe Nicola 43G/C
I-95126 **CATANIA**
Tel: (095) 37-10-87
Telex: 970291
C,P

Hewlett-Packard Italiana S.p.A.
Via G. Di Vittorio 9
I-20063 **CERNUSCO SUL NAVLIGLIO**
Tel: (2) 903691
Telex: 334632
A,CM,CP,E,MP,P

Hewlett-Packard Italiana S.p.A.
Via Nuova san Rocco A
Capodimonte, 62/A
I-80131 **NAPOLI**
Tel: (081) 7413544
A,CM,CS,E

Hewlett-Packard Italiana S.p.A.
Viale G. Modugno 33
I-16156 **GENOVA PEGLI**
Tel: (010) 68-37-07 E,C

Hewlett-Packard Italiana S.p.A.
Via Turazza 14
I-35100 **PADOVA**
Tel: (49) 664888
Telex: 430315
A,CM,CS,E,MS

Hewlett-Packard Italiana S.p.A.
Viale C. Pavese 340
I-00144 **ROMA**
Tel: (06) 54831
Telex: 610514
A,CM,CS,E,MS,P*

Hewlett-Packard Italiana S.p.A.
Corso Giovanni Lanza 94
I-10133 **TORINO**
Tel: (011) 682245, 659308
Telex: 221079
CM,CS,E

JAPAN

Yokogawa-Hewlett-Packard Ltd.
Inoue Building
1348-3, Asahi-cho
ATSUGI, Kanagawa 243
Tel: (0462) 24-0451
CM,C*,E

Yokogawa-Hewlett-Packard Ltd.
3-30-18 Tsuruya-cho
Kanagawa-ku, Yokohama-Shi
KANAGAWA, 221
Tel: (045) 312-1252
Telex: 382-3204 YHP YOK
CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Sannomiya-Daiichi Seimei-Bldg. 5F
69 Kyo-Machi Ikuta-Ku
KOBE CITY 650 Japan
Tel: (078) 392-4791
C,E

Yokogawa-Hewlett-Packard Ltd.
Kumagaya Asahi Yasoji Bldg 4F
4-3 Chome Tsukuba
KUMAGAYA, Saitama 360
Tel: (0485) 24-6563
CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Mito Mitsui Building
4-73, San-no-maru, 1-chome
MITO, Ibaragi 310
Tel: (0292) 25-7470
CM,CS,E

Yokogawa-Hewlett-Packard Ltd.
Sumitomo Seimei Bldg.
11-2 Shimo-sasajima-cho
Nakamura-ku
NAGOYA, Aichi 450
Tel: (052) 581-1850
CM,CS,E,MS

Yokogawa-Hewlett-Packard Ltd.
Chuo Bldg., 4th Floor
5-4-20 Nishinakajima, 5-chome
Yodogawa-ku, Osaka-shi
OSAKA, 532
Tel: (06) 304-6021
Telex: YHPOSA 523-3624
A,CM,CP,E,MP,P*

Yokogawa-Hewlett-Packard Ltd.
29-21 Takaido-Higashi 3-chome
Suginami-ku **TOKYO** 168
Tel: (03) 331-6111
Telex: 232-2024 YHPTOK
A,CM,CP,E,MP,P*

JORDAN

Mouasher Cousins Company
P.O. Box 1387
AMMAN
Tel: 24907, 39907
Telex: 21456 SABCO JO
E,M,P

KOREA

Samsung Electronics
4759 Shinkil, 6 Dong
Youngdeungpo-Ku,
SEOUL
Tel: 8334311, 8334312
Telex: SAMSAN 27364
A,C,E,M,P

KUWAIT

Al-Khalidya Trading & Contracting
P.O. Box 830 Safat
KUWAIT
Tel: 42-4910, 41-1726
Telex: 2481 Areeg kt
A,E,M

Photo & Cine Equipment
P.O. Box 270 Safat
KUWAIT
Tel: 42-2846, 42-3801
Telex: 2247 Matin
P

LUXEMBOURG

Hewlett-Packard Belgium S.A./N.V.
Blvd de la Woluwe, 100
Woluwedal
B-1200 ***BRUSSELS***
Tel: (02) 762-32-00
Telex: 23-494 paloben bru
A,CM,CP,E,MP,P

MALAYSIA

Hewlett-Packard Sales (Malaysia)
Sdn. Bhd.
Suite 2.21/2.22
Bangunan Angkasa Raya
Jalan Ampang
KUALA LUMPUR
Tel: 483544
Telex: MA31011
A,CP,E,M,P*

Protel Engineering
Lot 319, Satok Rd.
P.O. Box 1917
KUCHING, SARAWAK
Tel: 535-44
Telex: MA 70904 Promal
Cable: Proteleng
A,E,M

MEXICO

Hewlett-Packard Mexicana, S.A. de C.V.
Avenida Periferico Sur No. 6501
Tepepan, Xochimilco
MEXICO CITY 23, D.F.
Tel: (905) 676-4600
Telex: 017-74-507
A,CP,E,MS,P

Hewlett-Packard Mexicana, S.A. de C.V.
Rio Volga 600
Colonia del Valle
MONTERREY, N.L.
Tel: 78-42-93, 78-42-40, 78-42-41
Telex: 038-410
CS

MOROCCO

Dolbeau
81 rue Karatchi
CASABLANCA
Tel: 3041-82, 3068-38
Telex: 23051, 22822
E

Gerep
2 rue d'Agadir
Boite Postale 156
CASABLANCA
Tel: 272093, 272095
Telex: 23 739
P

NETHERLANDS

Hewlett-Packard Nederland B.V.
Van Heuven Goedhartlaan 121
NL 1181KK **AMSTELVEEN**
P.O. Box 667
NL1080 AR **AMSTELVEEN**
Tel: (20) 47-20-21
Telex: 13 216
A,CM,CP,E,MP,P

Hewlett-Packard Nederland B.V.
Bongerd 2
NL 2906VK **CAPPELLE**, A/D Ijesset
P.O. Box 41
NL2900 AA **CAPELLE**, Ijssel
Tel: (10) 51-64-44
Telex: 21261 HEPAC NL
A,CM,CP

NEW ZEALAND

Hewlett-Packard (N.Z.) Ltd.
169 Manukau Road
P.O. Box 26-189
Epsom, **AUCKLAND**
Tel: 68-7159
Cable: HEWPACK Auckland
CM,CS,E,P*

Hewlett-Packard (N.Z.) Ltd.
4-12 Cruickshank Street
P.O. Box 9443
Kilbirnie, **WELLINGTON** 3
Tel: 877-199
Cable: HEWPACK Wellington
CM,CP,E,P

Northrop Instruments & Systems Ltd.
Eden House, 44 Khyber Pass Road
P.O. Box 9682
Newmarket, ***AUCKLAND***
Tel: 794-091
A,M

Northrop Instruments & Systems Ltd.
Terrace House, 4 Oxford Terrace
P.O. Box 8388
CHRISTCHURCH
Tel: 64-165
A,M

Northrop Instruments & Systems Ltd.
Sturdee House
85-87 Ghuznee Street
P.O. Box 2406
WELLINGTON
Tel: 850-091
Telex: NZ 3380
A,M

NIGERIA

The Electronics Instrumentations Ltd.
N6B/S70 Oyo Road
Oluseun House
P.M.B. 5402
IBADAN
Tel: 461577
Telex: 31231 TEIL NG
A,E,M,P

The Electronics Instrumentations Ltd.
144 Agege Motor Road, Mushin
P.O. Box 6645
Mushin, ***LAGOS***
A,E,M,P

NORTHERN IRELAND

Cardiac Services Company
95A Finaghy Road South
BELFAST BT 10 OBY
Tel: (0232) 625-566
Telex: 747626
M

NORWAY

Hewlett-Packard Norge A/S
Folke Bernadottesvei 50
P.O. Box 3558
N-5033 **FYLLINGSDALEN** (BERGEN)
Tel: (05) 16-55-40
Telex: 16621 hpnas n
CM,CS,E

Hewlett-Packard Norge A/S
Oesterndalen 18
P.O. Box 34
N-1345 **OESTERAAS**
Tel: (02) 17-11-80
Telex: 16621 hpnas n
A*,CM,CP,E,MS,P

OMAN

Khimji Ramdas
P.O. Box 19
MUSCAT
Tel: 72-22-17, 72-22-25
Telex: 3289 BROKER MB MUSCAT
P

PAKISTAN

Mushko & Company Ltd.
10, Bazar Road
Sector G-6/4
ISLAMABAD
Tel: 28624
Cable: FEMUS Rawalpindi
A,E,M

Mushko & Company Ltd.
Oosman Chambers
Abdullah Haroon Road
KARACHI 0302
Tel: 511027, 512927
Telex: 2894 MUSHKO PW
Cable: COOPERATOR Karachi
*A,E,M,P**

PANAMA

Electrónico Balboa, S.A.
Apartado 4929
Panama 5
Calle Samuel Lewis
Edificio "Alfa" No. 2
CIUDAD DE PANAMA
Tel: 64-2700
Telex: 3480380
Cable: ELECTRON Panama
A,CM,E,M,P

Foto Internacional, S.A.
P.O. Box 2068
Free Zone of Colon
COLON 3
Tel: 45-2333
Telex: 3485126
Cable: IMPORT COLON/Panama
P

PERU

Cómpania Electro Médica S.A.
Los Flamencos 145, San Isidro
Casilla 1030
LIMA 1
Tel: 41-4325
Telex: Pub Booth 25424 SISIDRO
Cable: ELMEO Lima
A,CM,E,M,P

PHILIPPINES

The Online Advanced Systems Corporation
Rico House, Amorsolo Cor. Herrera Street
Legaspi Village, Makati
P.O. Box 1510
Metro MANILA
Tel: 85-35-81, 85-34-91, 85-32-21
Telex: 3274 ONLINE
A,C,E,M

Electronic Specialists and Proponents Inc.
690-B Epifanio de los Santos Avenue
Cubao, ***QUEZON CITY***
P.O. Box 2649 Manila
Tel: 98-96-81, 98-96-82, 98-96-83
Telex: 742-40287
P

POLAND

Buro Informasji Technicznej
Hewlett-Packard
Ul Stawki 2, 6P
PL00-950 WARSZAWA
Tel: 39-59-62, 39-67-43
Telex: 812453 hepa pl

SALES & SUPPORT OFFICES

Arranged alphabetically by country

PORTUGAL

Telectra-Empresa Técnica de Equipmentos Eléctricos S.a.r.l.
Rua Rodrigo da Fonseca 103
P.O. Box 2531
***P-LISBON** 1*
Tel: (19) 68-60-72
Telex: 12598
A,C,E,P

Mundinter
Intercambio Mundial de Comércio S.a.r.l
P.O. Box 2761
Avenida Antonio Augusto de Aguiar 138
P-LISBON
Tel: (19) 53-21-31, 53-21-37
Telex: 16691 munter p
M

PUERTO RICO

Hewlett-Packard Puerto Rico
P.O. Box 4407
CAROLINA, Puerto Rico 00630
Calle 272 Edificio 203
Urb. Country Club
RIO PIEDRAS, Puerto Rico 00924
Tel: (809) 762-7255
Telex: 345 0514
A,CP

QATAR

Nasser Trading & Contracting
P.O. Box 1563
DOHA
Tel: 22170
Telex: 4439 NASSER
M

Scitecharabia
P.O. Box 2750
!'DOHA
Tel: 329515
Telex: 4806 CMPARB
P

ROMANIA

Hewlett-Packard Reprezentanta
Boulevard Nicolae Balcescu 16
BUCURESTI
Tel: 130725
Telex: 10440

SAUDI ARABIA

Modern Electronic Establishment
P.O. Box 193
AL-KHOBAR
Tel: 44-678, 44-813
Telex: 670136
Cable: ELECTA AL-KHOBAR
C,E,M,P

Modern Electronic Establishment
P.O. Box 1228, Baghdadiah Street
JEDDAH
Tel: 27-798
Telex: 401035
Cable: ELECTA JEDDAH
C,E,M,P

Modern Electronic Establishment
P.O. Box 2728
RIYADH
Tel: 62-596, 66-232
Telex: 202049
C,E,M,P

SCOTLAND

Hewlett-Packard Ltd.
Royal Bank Buildings
Swan Street
BRECHIN, Angus, Scotland
Tel: 3101, 3102
CM,CS

Hewlett-Packard Ltd.
SOUTH QUEENSFERRY
West Lothian, EH30 9TG
GB-Scotland
Tel: (031) 3311000
Telex: 72682
A,CM,E,M

SINGAPORE

Hewlett-Packard Singapore (Pty.) Ltd.
P.O. Box 58 Alexandra Post Office
SINGAPORE, 9115
6th Floor, Inchcape House
450-452 Alexandra Road
SINGAPORE 0511
Tel: 631788
Telex: HPSGSO RS 34209
Cable: HEWPACK, Singapore
A,CP,E,MS,P

SOUTH AFRICA

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 120
Howard Place
Pine Park Center, Forest Drive, Pinelands
CAPE PROVINCE 7450
Tel: 53-7955, 53-7956, 53-7957
Telex: 57-0006
A,CM,CS,E,MS,P

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 37066
Overport
DURBAN 4067
Tel: 28-4178, 28-4179, 28-4110
CM,CS

Hewlett-Packard South Africa (Pty.) Ltd.
P.O. Box 33345
Glenstantia 0010 **TRANSVAAL**
1st Floor East
Constantia Park Ridge Shopping Centre
Constantia Park
PRETORIA Tel: 98-1126 or 98-1220
Telex: 32163
C,E

Hewlett-Packard South Africa (Pty.) Ltd.
Daphny Street
Private Bag Wendywood
SANDTON 2144
Tel: 802-5111, 802-5125
Telex: 89-84782
Cable: HEWPACK Johannesburg
A,CM,CP,E,MS,P

SPAIN

Hewlett-Packard Española S.A.
c/Entenza, 321
E-BARCELONA 29
Tel: (3) 322-24-51, 321-73-54
Telex: 52603 hpbee
A,CM,CP,E,MS,P

Hewlett-Packard Española S.A.
c/San Vicente S/N
Edificio Albia II,7 8
E-BILBAO 1
Tel: (944) 423-8306, 423-8206
A,CM,E,MS

Hewlett-Packard Española S.A.
Calle Jerez 3
E-MADRID 16
Tel: 458-2600
Telex: 23515 hpe
A,CM,E,MP,P

Hewlett-Packard Española S.A.
Colonia Mirasierra
Edificio Juban
c/o Costa Brava 13, 2.
E-MADRID 34
Tel: 734-8061, 734-1162
CM,CP

Hewlett-Packard Española S.A.
Av Ramón y Cajal 1-9
Edificio Sevilla 1,
E-SEVILLA 5
Tel: 64-44-54, 64-44-58
Telex: 72933
A,CM,CS,MS,P

Hewlett-Packard Española S.A.
C/Ramon Gordillo, 1 (Entlo.3)
E-VALENCIA 10
Tel: 361-1354, 361-1358
CM,CS,P

SWEDEN

Hewlett-Packard Sverige AB
Enighetsvägen 3, Fack
P.O. Box 20502
S-16120 **BROMMA**
Tel: (08) 730-0550
Telex: (854) 10721 MESSAGES
Cable: MEASUREMENTS STOCKHOLM
A,CM,CP,E,MS,P

Hewlett-Packard Sverige AB
Sunnanvagen 14K
S-22226 **LUND**
Tel: (46) 13-69-79
Telex: (854) 10721 (via 8ROMMA office)
CM,CS

Hewlett-Packard Sverige AB
Vastra Vintergatan 9
S-70344 **OREBRO**
Tel: (19) 10-48-80
Telex: (854) 10721 (via 8ROMMA office)
CM,CS

Hewlett-Packard Sverige AB
Frötallisgatan 30
S-42132 **VÄSTRA-FRÖLUNDA**
Tel: (031) 49-09-50
Telex: (854) 10721 (via 8ROMMA office)
CM,CS,E,P

SWITZERLAND

Hewlett-Packard (Schweiz) AG
Clarastrasse 12
CH-4058 **BASLE**
Tel: (61) 33-59-20
A,CM

Hewlett-Packard (Schweiz) AG
47 Avenue Blanc
CH-1202 **GENEVA**
Tel: (022) 32-30-05, 32-48-00
CM,CP

Hewlett-Packard (Schweiz) AG
29 Chemin Château Bloc
CH-1219 **LE LIGNON**-Geneva
Tel: (022) 96-03-22
Telex: 27333 hpag ch
Cable: HEWPACKAG Geneva
A,CM,E,MS,P

Hewlett-Packard (Schweiz) AG
Zürcherstrasse 20
Altmend 2
CH-8967 **WIDEN**
Tel: (57) 50-111
Telex: 59933 hpag ch
Cable: HPAG CH
A,CM,CP,E,MS,P

SYRIA

General Electronic Inc.
Nuri Basha-Ahnat Ebn Kays Street
P.O. Box 5781
DAMASCUS
Tel: 33-24-87
Telex: 11215 ITIKAL
Cable: ELECTROBOR DAMASCUS
E

Sawah & Co.
Place Azmé
Boite Postale 2308
DAMASCUS
Tel: 16-367, 19-697, 14-268
Telex: 11304 SATACO SY
Cable: SAWAH, DAMASCUS
M

TAIWAN

Hewlett-Packard Far East Ltd.
Kaohsiung Branch
68-2, Chung Cheng 3rd Road
Shin Shin, Chu
KAOHSIUNG
Tel: 24-2318, 26-3253
CS,E,MS,P

Hewlett-Packard Far East Ltd.
Taiwan Branch
5th Floor
205 Tun Hwa North Road
TAIPEI
Tel:(02) 751-0404
Cable:HEWPACK Taipei
A,CP,E,MS,P

Hewlett-Packard Far East Ltd.
Taichung Branch
#33, Cheng Yih Street
10th Floor, Room 5
TAICHUNG
Tel: 289274

Ing Lih Trading Co.
3rd Floor 18, Po-la Road
TAIPEI
Tel:
Telex:
Cable: INGLIH TAIPEI
A

THAILAND

UNIMESA Co. Ltd.
Elcom Research Building
2538 Sukhumvit Ave.
*Bangchak, **BANGKOK***
Tel: 393-2387, 393-0338
Telex: TH81160, 82938, 81038
Cable: UNIMESA Bangkok
A,C,E,M

Bangkok Business Equipment Ltd.
5/5-6 Dejo Road
BANGKOK
Tel: 234-8670, 234-8671, 234-8672
Cable: BUSIOUIPT Bangkok
P

TRINIDAD & TOBAGO

Caribbean Telecoms Ltd.
P.O. Box 732
50/A Jerningham Avenue
PORT-OF-SPAIN
Tel: 624-4213, 624-4214
A,CM,E,M,P

TUNISIA

Tunisie Electronique
31 Avenue de la Liberte
TUNIS
Tel: 280-144
E,P

Corema
1 ter. Av. de Carthage
TUNIS
Tel: 253-821
Telex: 12319 CABAM TN
M

TURKEY

Teknim Company Ltd.
Riza Sah Pehievi
Caddesi No. 7
*Kavaklidere, **ANKARA***
Tel: 275800
Telex: 42155
E

EMA, Muhendislik Kollektif Sirketi
Mediha Eldem
Sokak 41/6
*Yüksel Caddesi, **ANKARA***
Tel: 17-56-22
Cable: Ematrade
M

UNITED ARAB EMIRATES

Emitac Ltd.
P.O. Box 1641
SHARJAH
Tel: 354121, 354123
Telex: 68136
E,M,P,C

UNITED KINGDOM

see: GREAT BRITAIN NORTHERN IRELAND SCOTLAND

UNITED STATES

Alabama

Hewlett-Packard Co.
700 Century Park South
Suite 128
BIRMINGHAM, AL 35226
Tel: (205) 822-6802
CM,CS,MP

Hewlett-Packard Co.
P.O. Box 4207
8290 Whitesburg Drive, S.E.
HUNTSVILLE, AL 35802
Tel: (205) 881-4591
CM,CP,E,M*

Alaska

Hewlett-Packard Co.
1577 "C" Street, Suite 252
ANCHORAGE, AK 99510
Tel: (206) 454-3971
CM,CS**

Arizona

Hewlett-Packard Co.
2336 East Magnolia Street
PHOENIX, AZ 85034
Tel: (602) 273-8000
A,CM,CP,E,MS

Hewlett-Packard Co.
2424 East Aragon Road
TUCSON, AZ 85702
Tel: (602) 889-4631
CM,CS,E,MS**

Arkansas

Hewlett-Packard Co.
P.O. Box 5646
Brady Station
LITTLE ROCK, AR 72215
Tel: (501) 376-1844, (501) 664-8773
CM,MS

UNITED STATES (Cont.)

California

Hewlett-Packard Co.
7621 Canoga Avenue
CANOGA PARK, CA 91304
Tel: (213) 702-8300
A,CM,CP,E,P

Hewlett-Packard Co.
1579 W. Shaw Avenue
FRESNO, CA 93771
Tel: (209) 224-0582
CM,MS

Hewlett-Packard Co.
1430 East Orangethorpe
FULLERTON, CA 92631
Tel: (714) 870-1000
CM,CP,E,MP

Hewlett-Packard Co.
5400 W. Rosecrans Boulevard
LAWNDALE, CA 90260
P.O. Box 92105
LOS ANGELES, CA 90009
Tel: (213) 970-7500
CM,CP,MP

Hewlett-Packard Co.
3939 Lankershim Blvd.
NORTH HOLLYWOOD, CA 91604
Tel: (213) 877-1282
Regional Headquarters

Hewlett-Packard Co.
3200 Hillview Avenue
PALO ALTO, CA 94304
Tel: (415) 857-8000
CM,CP,E

Hewlett-Packard Co.
646 W. North Market Boulevard
SACRAMENTO, CA 95834
Tel: (916) 929-7222
A*,CM,CP,E,MS

Hewlett-Packard Co.
9606 Aero Drive
P.O. Box 23333
SAN DIEGO, CA 92123
Tel: (714) 279-3200
CM,CP,E,MP

Hewlett-Packard Co.
3003 Scott Boulevard
SANTA CLARA, CA 95050
Tel: (408) 988-7000
A,CM,CP,E,MP

Hewlett-Packard Co.
454 Carlton Court
SO. SAN FRANCISCO, CA 94080
Tel: (415) 877-0772
CM,CP

Colorado

Hewlett-Packard Co.
24 Inverness Place, East
ENGLEWOOD, CO 80112
Tel: (303) 771-3455
A,CM,CP,E,MS

Connecticut

Hewlett-Packard Co.
47 Barnes Industrial Road South
P.O. Box 5007
WALLINGFORD, CT 06492
Tel: (203) 265-7801
A,CM,CP,E,MS

Florida

Hewlett-Packard Co.
P.O. Box 24210
2727 N.W. 62nd Street
FORT LAUDERDALE, FL 33309
Tel: (305) 973-2600
CM,CP,E,MP

Hewlett-Packard Co.
4080 Woodcock Drive, #132
Brownett Building
JACKSONVILLE, FL 32207
Tel: (904) 398-0663
CM,C*,E*,MS**

Hewlett-Packard Co.
P.O. Box 13910
6177 Lake Ellenor Drive
ORLANDO, FL 32809
Tel: (305) 859-2900
A,CM,CP,E,MS

Hewlett-Packard Co.
6425 N. Pensacola Blvd.
Suite 4, Building 1
PENSACOLA, FL 32575
Tel: (904) 476-8422
A,CM,MS

Hewlett-Packard Co.
110 South Hoover, Suite 120
Vanguard Bldg.
TAMPA, FL 33609
Tel: (813) 872-0900
A*,CM,CS,E*,M*

Georgia

Hewlett-Packard Co.
P.O. Box 105005
2000 South Park Place
ATLANTA, GA 30339
Tel: (404) 955-1500
Telex: 810-766-4890
A,CM,CP,E,MP

Hewlett-Packard Co.
Executive Park Suite 306
P.O. Box 816
AUGUSTA, GA 30907
Tel: (404) 736-0592
CM,MS

Hewlett-Packard Co.
P.O. Box 2103
1172 N. Davis Drive
WARNER ROBINS, GA 31098
Tel: (912) 922-0449
CM,E

Hawaii

Hewlett-Packard Co.
Kawaiahao Plaza, Suite 190
567 South King Street
HONOLULU, HI 96813
Tel: (808) 526-1555
A,CM,CS,E,MS

Idaho

Hewlett-Packard Co.
11311 Chinden Boulevard
BOISE, ID 83707
Tel: (208) 376-6000
CM,CS,M*

Illinois

Hewlett-Packard Co.
211 Prospect Road
BLOOMINGTON, IL 61701
Tel: (309) 663-0383
CM,CS,MS**

Hewlett-Packard Co.
1100 31st Street
DOWNERS GROVE, IL 60515
Tel: (312) 960-5760
CM,CP

Hewlett-Packard Co.
5201 Tollview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800
A,CM,CP,E,MP

Indiana

Hewlett-Packard Co.
P.O. Box 50807
7301 No. Shadeland Avenue
INDIANAPOLIS, IN 46250
Tel: (317) 842-1000
A,CM,CS,E,MS

Iowa

Hewlett-Packard Co.
2415 Heinz Road
IOWA CITY, IA 52240
Tel: (319) 351-1020
CM,CS,E*,MS

Kansas

Hewlett-Packard Co.
1644 S. Rock
WICHITA, KA 67207
Tel: (316) 265-5200
CM,CS

Kentucky

Hewlett-Packard Co.
10170 Linn Station Road
Suite 525
LOUISVILLE, KY 40223
Tel: (502) 426-0100
A,CM,CS,MS

Louisiana

Hewlett-Packard Co.
P.O. Box 1449
3229 Williams Boulevard
KENNER, LA 70062
Tel: (504) 443-6201
A,CM,CS,E,MS

Maryland

Hewlett-Packard Co.
7121 Standard Drive
HANOVER, MD 21076
Tel: (301) 796-7700
A,CM,CP,E,MS

Hewlett-Packard Co.
2 Choke Cherry Road
ROCKVILLE, MD 20850
Tel: (301) 948-6370
Telex: 710-828-9685
A,CM,CP,E,MP

Massachusetts

Hewlett-Packard Co.
32 Hartwell Avenue
LEXINGTON, MA 02173
Tel: (617) 861-8960
A,CM,CP,E,MP

Michigan

Hewlett-Packard Co.
23855 Research Drive
FARMINGTON HILLS, MI 48024
Tel: (313) 476-6400
A,CM,CP,E,MP

Hewlett-Packard Co.
4326 Cascade Road S.E.
GRAND RAPIDS, MI 49506
Tel: (616) 957-1970
CM,CS,MS

Minnesota

Hewlett-Packard Co.
2025 W. Larpenteur Ave.
ST. PAUL, MN 55113
Tel: (612) 644-1100
A,CM,CP,E,MP

Mississippi

Hewlett-Packard Co.
P.O. Box 5028
322 N. Mart Plaza
JACKSON, MS 39216
Tel: (601) 982-9363
CM,MS

Missouri

Hewlett-Packard Co.
11131 Colorado Avenue
KANSAS CITY, MO 64137
Tel: (816) 763-8000
Telex: 910-771-2087
A,CM,CS,E,MS

Hewlett-Packard Co.
1024 Executive Parkway
ST. LOUIS, MO 63141
Tel: (314) 878-0200
A,CM,CP,E,MP

Nebraska

Hewlett-Packard
7101 Mercy Road
Suite 101, IBX Building
OMAHA, NE 68106
Tel: (402) 392-0948
CM,MS

Nevada

Hewlett-Packard Co.
Suite D-130
5030 Paradise Blvd.
LAS VEGAS, NV 89119
Tel: (702) 736-6610
CM,MS**

New Jersey

Hewlett-Packard Co.
Crystal Brook Professional Building
Route 35
EATONTOWN, NJ 07724
Tel: (201) 542-1384
A*,CM,C*,E*,P*

Hewlett-Packard Co.
W120 Century Road
PARAMUS, NJ 07652
Tel: (201) 265-5000
A,CM,CP,E,MP

Hewlett-Packard Co.
60 New England Avenue West
PISCATAWAY, NJ 08854
Tel: (201) 981-1199
A,CM,CP,E

New Mexico

Hewlett-Packard Co.
P.O. Box 11634
11300 Lomas Blvd.,N.E.
ALBUQUERQUE, NM 87123
Tel: (505) 292-1330
Telex: 910-989-1185
CM,CP,E,MS

New York

Hewlett-Packard Co.
5 Computer Drive South
ALBANY, NY 12205
Tel: (518) 458-1550
Telex: 710-444-4691
A,CM,CS,E,MS

Hewlett-Packard Co.
9600 Main Street
CLARENCE, NY 14031
Tel: (716) 759-8621
Telex: 710-523-1893

Hewlett-Packard Co.
200 Cross Keys Office
FAIRPORT, NY 14450
Tel: (716) 223-9950
Telex: 510-253-0092
CM,CP,E,MS

Hewlett-Packard Co.
No. 1 Pennsylvania Plaza
55th Floor
34th Street & 8th Avenue
NEW YORK, NY 10119
Tel: (212) 971-0800
CM,CP,E*,M*

Hewlett-Packard Co.
5858 East Molloy Road
SYRACUSE NY 13211
Tel: (315) 455-2486
A,CM,CS,E,MS

Hewlett-Packard Co.
3 Crossways Park West
WOODBURY, NY 11797
Tel: (516) 921-0300
Telex: 510-221-2183
A,CM,CP,E,MS

North Carolina

Hewlett-Packard Co.
P.O. Box 15579
2905 Guess Road (27705)
DURHAM, NC 27704
Tel: (919) 471-8466
C,M

Hewlett-Packard Co.
5605 Roanne Way
GREENSBORO, NC 27409
Tel: (919) 852-1800
A,CM,CP,E,MS

Ohio

Hewlett-Packard Co.
9920 Carver Road
CINCINNATI, OH 45242
Tel: (513) 891-9870
CM,CP,MS

Hewlett-Packard Co.
16500 Sprague Road
CLEVELAND, OH 44130
Tel: (216) 243-7300
Telex: 810-423-9430
A,CM,CP,E,MS

Hewlett-Packard Co.
962 Crupper Ave.
COLUMBUS, OH 43229
Tel: (614) 436-1041
CM,CP,E*

Hewlett-Packard Co.
330 Progress Rd.
DAYTON, OH 45449
Tel: (513) 859-8202
A,CM,CP,E*,MS

Oklahoma

Hewlett-Packard Co.
P.O. Box 366
1503 W. Gore Blvd., Suite #2
LAWTON, OK 73502
Tel: (405) 248-4248
C

Hewlett-Packard Co.
P.O. Box 32008
304 N. Meridan Avenue, Suite A
OKLAHOMA CITY, OK 73107
Tel: (405) 946-9499
A*,CM,CP,E*,MS

Hewlett-Packard Co.
Suite 121
9920 E. 42nd Street
TULSA, OK 74145
Tel: (918) 665-3300
A**,CM,CS,M*

Oregon

Hewlett-Packard Co.
1500 Valley River Drive, Suite 330
EUGENE, OR 97401
Tel: (503) 683-8075
C

Hewlett-Packard Co.
9255 S. W. Pioneer Court
WILSONVILLE, OR 97070
Tel: (503) 682-8000
A,CM,CP,E*,MS

Pennsylvania

Hewlett-Packard Co.
1021 8th Avenue
King of Prussia Industrial Park
KING OF PRUSSIA, PA 19406
Tel: (215) 265-7000
Telex: 510-660-2670
A,CM,CP,E,MP

Hewlett-Packard Co.
111 Zeta Drive
PITTSBURGH, PA 15238
Tel: (412) 782-0400
A,CM,CP,E,MP

South Carolina

Hewlett-Packard Co.
P.O. Box 6442
6941-0 N. Trenholm Road
COLUMBIA, SC 29260
Tel: (803) 782-6493
CM,CS,E,MS

6

SALES & SUPPORT OFFICES

Arranged alphabetically by country

UNITED STATES (Cont.)

South Carolina (Cont.)
Hewlett-Packard Co.
814 Wade Hampton Blvd.
Suite 10
GREENVILLE, SC 29609
Tel: (803) 232-0917
C

Tennessee
Hewlett-Packard Co.
P.O. Box 22490
224 Peters Road
Suite 102
KNOXVILLE, TN 37922
Tel: (615) 691-2371
A*,CM,MS

Hewlett-Packard Co.
3070 Directors Row
MEMPHIS, TN 38131
Tel: (901) 346-8370
A,CM,CS,MS

Hewlett-Packard Co.
Suite 103
478 Craighead Street
NASHVILLE, TN 37204
Tel: (615) 383-9136
CM,MS**

Texas
Hewlett-Packard Co.
Suite 310W
7800 Shoalcreek Blvd.
AUSTIN, TX 78757
Tel: (512) 459-3143
CM,E

Hewlett-Packard Co.
Suite C-110
4171 North Mesa
EL PASO, TX 79902
Tel: (915) 533-3555
CM,CS,E*,MS**

Hewlett-Packard Co.
5020 Mark IV Parkway
FORT WORTH, TX 76106
Tel: (817) 625-6361
CM,C*

Hewlett-Packard Co.
P.O. Box 42816
10535 Harwin Street
HOUSTON, TX 77036
Tel: (713) 776-6400
A,CM,CP,E,MP

Hewlett-Packard Co.
3309 67th Street
Suite 24
LUBBOCK, TX 79413
Tel: (806) 799-4472
M

Hewlett-Packard Co.
P.O. Box 1270
930 E. Campbell Rd.
RICHARDSON, TX 75081
Tel: (214) 231-6101
A,CM,CP,E,MP

Hewlett-Packard Co.
205 Billy Mitchell Road
SAN ANTONIO, TX 78226
Tel: (512) 434-8241
CM,CS,E,MS

Utah
Hewlett-Packard Co.
3530 W. 2100 South Street
SALT LAKE CITY, UT 84119
Tel: (801) 974-1700
A,CM,CP,E,MS

Virginia
Hewlett-Packard Co.
P.O. Box 9669
2914 Hungary Spring Road
RICHMOND, VA 23228
Tel: (804) 285-3431
A,CM,CP,E,MS

Hewlett-Packard Co.
P.O. Box 4786
3110 Peters Creek Road, N.W.
ROANOKE, VA 24015
Tel: (703) 563-2205
CM,CS,E**

Hewlett-Packard Co.
P.O. Box 12778
5700 Thurston Avenue
Suite 111
VIRGINIA BEACH, VA 23455
Tel: (804) 460-2471
CM,CS,MS

Washington
Hewlett-Packard Co.
15815 S.E. 37th Street
BELLEVUE, WA 98006
Tel: (206) 643-4000
A,CM,CP,E,MP

Hewlett-Packard Co.
Suite A
708 North Argonne Road
SPOKANE, WA 99206
Tel: (509) 922-7000
CM,CS

West Virginia
Hewlett-Packard Co.
4604 MacCorkle Ave., S.E.
CHARLESTON, WV 25304
Tel: (304) 925-0492
A,CM,MS

Wisconsin
Hewlett-Packard Co.
150 S. Sunny Slope Road
BROOKFIELD, WI 53005
Tel: (414) 784-8800
A,CM,CS,E*,MP

URUGUAY

Pablo Ferrando S.A.C. e.I.
Avenida Italia 2877
Casilla de Correo 370
MONTEVIDEO
Tel: 403102
Telex: 901 Public Booth Para Pablo Ferrando 919520
Cable: RADIUM Montevideo
A,CM,E,M

Guillermo Kraft del Uruguay S.A.
Avda. Libertador Brig. Gral.
Lavalleja 2083
MONTEVIDEO
Tel: 234588, 234808, 208830
Telex: 6245 ACTOUR UY
P

U.S.S.R.

Hewlett-Packard Co.
Representative Office
Pokrovsky Blvd. 4/17 KV12
MOSCOW 101000 Tel: 294-2024
Telex: 7825 HEWPACK SU

VENEZUELA

Hewlett-Packard de Venezuela C.A.
Apartado 50933
3A Transversal Los Ruices Norte
Edificio Segre 2Y3
CARACAS 1071
Tel: 239-4133, 239-4777, 239-4244
Telex: 25146 HEWPACK
Cable: HEWPACK Caracas
A,CP,E,MS,P

YUGOSLAVIA

Iskra-Commerce-Representation of Hewlett-Packard
Sava Centar Delegacija 30
Milentija Popovica 9
*11170 **BEOGRAD***
Tel: 638-762
Telex: 12042, 12322 YU SAV CEN

Iskra-Commerce-Representation of Hewlett-Packard
Koprska 46
*61000 **LJUBLJANA***
Tel: 321674, 315879
Telex:

ZAMBIA

R. J. Tilbury (Zambia) Ltd.
P.O. Box 2792
LUSAKA
Tel: 81243
A,E,M,P

ZIMBABWE

Field Technical Sales
45 Kelvin Road, North
P.B. 3458
SALISBURY
Tel:
C,E,M,P

FOR COUNTRIES AND AREAS NOT LISTED:

CANADA

Ontario
Hewlett-Packard (Canada) Ltd.
6877 Goreway Drive
MISSISAUGA, Ontario L4V 1M8
Tel: (416) 678-9430
Telex: 610-492-4246

EASTERN USA

Maryland
Hewlett-Packard Co.
4 Choke Cherry Road
Rockville, MD 20850
Tel: (301) 258-2000

MIDWESTERN USA

Illinois
Hewlett-Packard Co.
5201 Tollview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800

SOUTHERN USA

Georgia
Hewlett-Packard Co.
P.O. Box 105005
450 Interstate N. Parkway
ATLANTA, GA 30339
Tel: (404) 955-1500

WESTERN USA

California
Hewlett-Packard Co.
3939 Lankersim Blvd.
LOS ANGELES, CA 91604
Tel: (213) 877-1282

EUROPEAN AREAS NOT LISTED, CONTACT

SWITZERLAND
Hewlett-Packard S.A.
7 Rue du Bois-du-Lan
CH-1217 **MEYRIN 2**, Switzerland
Tel: (022) 83-81-11
Telex: 27835 hpse
Cable: HEWPACKSA Geneve

EAST EUROPEAN AREAS NOT LISTED, CONTACT

AUSTRIA
Hewlett-Packard Ges.m.b.h.
Wehlistrasse 29
P.O. Box 7
A-1205 **VIENNA**
Tel: (222) 35-16-210
Telex: 135823/135066

MEDITERRANEAN AND MIDDLE EAST AREAS NOT LISTED, CONTACT

GREECE
Hewlett-Packard S.A.
Mediterranean & Middle East Operations
35, Kolokotroni Street
Platia Kefallariou
GR-Kifissia, **ATHENS**, Greece
Tel: 808-0359, 808-0429
Telex: 21-6588
Cable: HEWPACKSA Athens

INTERNATIONAL AREAS NOT LISTED, CONTACT

OTHER AREAS
Hewlett-Packard Co.
Intercontinental Headquarters
3495 Deer Creek Road
PALO ALTO, CA 94304
Tel: (415) 857-1501
Telex: 034-8300
Cable: HEWPACK

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HEWLETT-PACKARD COMPANY
Data Systems Division
11000 Wolfe Road
Cupertino, California 95014